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MATHEMATICAL
AND
NAUTICAL TABLES



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MATHEMATICAL TABLES

FOR

TRIGONOMETRICAL, ASTRONOMICAL, AND NAUTICAL
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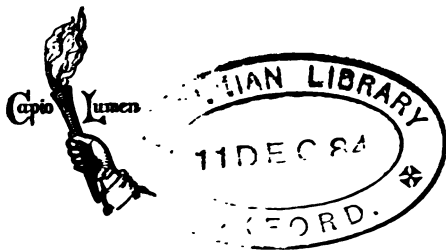
TO WHICH IS PREFIXED

A TREATISE ON LOGARITHMS

By HENRY LAW,

MEMBER OF THE INSTITUTION OF CIVIL ENGINEERS, &c. &c.

NEW AND REVISED EDITION



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PREFACE.

THE first part of the following work is intended to have a twofold object—viz., to explain and illustrate the use and application of logarithms for the practical calculator, and to set forth and demonstrate their nature and properties for the Mathematical student. While, therefore, the Theoretical and Practical parts have been kept distinct, so that either might be separately studied or referred to, they have been so written with reference to each other as to form but one connected treatise, which the student, who really wishes to become thoroughly acquainted with the subject, should entirely peruse. For, although a knowledge of their mathematical properties is not essential to a knowledge of their use, yet they are so intimately connected that the acquirement of one greatly facilitates the acquirement of the other.

The second part of the work, while complete within itself, is intended also to form a companion or supplemental volume to two others of Mr. Weale's Rudimentary Series; namely, to the Rudiments of Nautical Astronomy, and the Rudiments of Navigation. In order to the attainment of the first object, such an explanation has been

prefixed to the Tables of this part as is sufficient for showing the manner in which they are to be used, and the purposes for which they are to be employed; and such examples of their application have been added as will, it is hoped, remove all difficulty in their employment.

The Tables of the Logarithms of Numbers, and of Logarithmic sines, tangents, &c., have been reprinted from the third edition of Gregory's *Mathematics for Practical Men*; and the Table of Proportional Parts, first given in that work, has been arranged in a new and more convenient way in the present Tables.

Tables I. to V. will be found of considerable service for general purposes of calculation, in addition to their application with Tables VI. to XVIII. to the important purposes of Navigation and Nautical Astronomy.

The remaining Tables will be found of constant use in all mathematical investigations involving trigonometrical expressions; these are principally compiled from Hutton's *Mathematical Tables*.

In the preparation of the Tables and in their progress through the press, every care has been taken by careful and repeated reading to insure accuracy, an object which it is confidently hoped has been successfully attained.

II. L.

OLD WINDSOR, *July*, 1850.

Owing to the large number of copies which have been printed the stereotype plates had become much worn. For the present edition they have been very carefully examined and restored, and all the errors which upwards of thirty-three years' use of the Tables has discovered have been corrected.

H. L.

5, QUEEN ANNE'S GATE, *Jan.*, 1884.

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A

RUDIMENTARY TREATISE

ON

L O G A R I T H M S.

CHAPTER I.

Explanation and Definitions of Logarithms.

THE word Logarithm is derived from two Greek words (*λογος*, *ratio*, and *αριθμος*, *number*), and signifies the *ratios of numbers*.

By the *ratio* of two numbers, or the *proportion* which one number bears to the other (the two terms being synonymous), is meant the *magnitude of the quotient* arising from the division of one number by the other. Thus, the ratio of 2 to 6 is expressed by $\frac{2}{6}$, and any other two numbers would be said to have the same ratio when the quotient arising from the division of one by the other was the same; so, $\frac{4}{12}$ being equal to $\frac{2}{6}$, 4 is said to have the same ratio to 12 that 2 has to 6.

This is frequently written—

$$4 : 12 :: 2 : 6$$

and is read, as 4 is to 12 so is 2 to 6; it signifies nothing more than that the ratio of the two first numbers is the same as that of the two last, or that $\frac{4}{12} = \frac{2}{6}$.

A series of numbers is said to be in *continued proportion* when the ratio between each two consecutive numbers is the same, thus—

§

2, 6, 18, 54, 162,

B

are in continued proportion, because the ratios of 2 to 6, 6 to 18, 18 to 54, and 54 to 162, or $\frac{2}{6}$, $\frac{6}{18}$, $\frac{18}{54}$, $\frac{54}{162}$, are all equal. Now, the ratio of 2 to 18 is made up of the ratio of 2 to 6 and 6 to 18; but as these are equal, it is twice the ratio of 2 to 6; so, in like manner, the ratio of 2 to 54 is three times the ratio of 2 to 6; and the ratio of 2 to 162 is four times that of 2 to 6.

In order to examine some of the properties of a series of numbers in continued proportion, let us take the following, which is a more extensive series than the preceding:—

1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048 . . . (A),

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 . . . (B),

and let us place under each term in this series a number expressing how many times the ratio of 1 to 2 is contained in the ratio of 1 to that term; we see at once that under 1 we must place 0, and under 2 we must place 1; also, since the ratio of 1 to 4 is twice that of 1 to 2, under 4 we must place 2, and since the ratio of 1 to 8 is three times that of 1 to 2, under 8 we must place 3; and, proceeding in a similar manner, we shall obtain the numbers in the second line above. Now, the numbers which we have thus placed under the terms of the proportion are *logarithms* of those terms, and are so called because they express the number of ratios of unity to the first term contained in the ratio of unity to the term under which they are placed.

The numbers composing a series in continued proportion, similar to the above, will, on examination, be found to be derived from each other by the continual multiplication of the previous term by some constant number; thus, in the first series, 6 is derived from 2 by being multiplied by 3, and in like manner 18 is obtained from 6, and 54 from 18; so in the second series, the constant multiplier is 2, each term being derived from the preceding by multiplication by that number. A series of numbers thus obtained by the continual multiplication of its terms by a constant number is called a *geometrical series*; such is the series (A) above; while a series in which the terms are derived by the continual addition of a constant number is termed an *arithmetical series*, an example of which is afforded by the series (B) above.

Now, whatever the number may be by the continual multiplication of which the *geometrical series* is formed, if the series commences with unity, and under it is written the

arithmetical series formed by the continued addition of unity, commencing with the cypher, then will the numbers in the lower line express the number of ratios of unity to the first term, of which the ratio of unity to all the other terms is made up, and therefore they will be the logarithms of the numbers in the line above them. For example:—

1, 3, 9, 27, 81, 243 { are the numbers forming a geometrical series;
 of which 0, 1, 2, 3, 4, 5 { are the logarithms forming an arithmetical series.
 So, 1, 7, 49, 343, 2401 { are the numbers forming a geometrical series;
 of which 0, 1, 2, 3, 4 { are the logarithms forming an arithmetical series.
 And again, 1, 10, 100, 1000, 10000 { are the numbers forming a geometrical series;
 of which 0, 1, 2, 3, 4 { are the logarithms forming an arithmetical series.

Now, from the very nature of a geometrical series, it follows, that its terms are all powers of the constant number by the multiplication of which they are produced, and therefore, in place of writing the numbers themselves, we might introduce the expression denoting the power, without actually performing the multiplication, and we should thus obtain for the three geometrical series above, writing them vertically instead of in horizontal lines*,

Nos.	Logs.	Nos.	Logs.	Nos.	Logs.
1 = 3 ⁰		1 = 7 ⁰		1 = 10 ⁰	
3 = 3 ¹		7 = 7 ¹		10 = 10 ¹	
9 = 3 ²		49 = 7 ²		100 = 10 ²	
27 = 3 ³		343 = 7 ³		1000 = 10 ³	
81 = 3 ⁴		2401 = 7 ⁴		10000 = 10 ⁴	
243 = 3 ⁵					

In these we perceive immediately that the numbers denoting the powers, or, as they are termed, the *indices* or *exponents* of the *powers*, are the same as the arithmetical series given above, and that they are therefore the logarithms of the numbers in the first columns. The constant number, of which the powers are successively taken, is termed the *root* or *radix*, and may have any value that we please assigned to it. Thus, we derive another definition of a logarithm, which may be de-

* It must be borne in mind that $a^0 = 1$, and $a^1 = a$, whatever the value of a may be.

scribed as *the index or exponent, to which a certain root or base must be involved, in order to be equal to the number of which it is the logarithm*. It is, therefore, evident that a given number may have any number of logarithms corresponding with it; or that the same logarithm may serve for several different numbers, according to the value assumed for the base or root to be involved, or what is the same thing, the common ratio of the geometrical progression*. Thus, in the examples above, the bases or common ratios are 3, 7, and 10.

We have, therefore, three distinctly different definitions which may be given of logarithms, depending upon the particular way in which they are regarded, and we shall recapitulate these definitions, before proceeding farther, in order to insure their being thoroughly understood.

1. The logarithm of a given number is the number of ratios of some assumed constant number to unity, contained in the ratio of the given number to unity.

2. Logarithms are a series of numbers in *arithmetical progression*, answering to another series of numbers in *geometrical progression*; so taken that 0 in the first corresponds with 1 in the latter.

3. The logarithm of a number is the index or exponent of the power, to which a given constant base or root must be involved, to be equal to that number.

Whichever of these definitions may be adopted, the same general properties may be deduced as belonging to logarithms; we shall, however, in the following pages, consider them under the notion involved in the third definition, as the exponents of the powers of some constant root. And, in order to a more perfect conception of the subject, we shall first consider the properties of the exponents of powers generally.

CHAPTER II.

On the Exponents of Powers.

In algebra, the powers of a quantity, or the number of times that that quantity has been employed as a factor to produce a given quantity, are denoted by that number being written

* See page 13.

somewhat to the right and above the number or letter expressing the original quantity or root of the power. Thus, the square of 6 is written 6^2 ; the cube of x , x^3 ; and the fifth power of 12, 12^5 . In the first example, as 6 enters twice as a factor, it is called the second power, and is denoted by 2 written over the 6; in the second example, as x enters three times as a factor, it is called the third power, and is denoted by a 3 written above the x ; and in the last example, as 12 enters five times as a factor, it is termed the fifth power, and is written 12^5 . The number thus placed over a number, to denote the power to which it is required to be raised, is termed the *index* or *exponent* of that power; as the former of these terms is sometimes employed in a different sense, to avoid ambiguity we shall use only the last. Thus, in the foregoing examples, 2, 3, and 5 are the exponents of the powers, to which the quantities 6, x , and 12 are to be respectively raised or involved.

Frequently letters are employed instead of numbers as exponents of powers; thus, x^a denotes that the quantity represented by x is to be raised to the power represented by a ; and b^n , that the quantity b is to be raised to the power of n , or the n th power. The quantities, as x or b , in the foregoing examples, which have to be involved, or the powers of which are to be taken, are termed the *roots* or *bases*.

When it is desired to multiply any two powers of a quantity, a very little consideration will show that their product will be equal to a power of that same quantity, whose exponent is the sum of the two exponents of the powers to be multiplied. For, let us suppose the powers to be multiplied to be x^3 and x^2 , then $x^3 = x \cdot x \cdot x$, and $x^2 = x \cdot x$, therefore, $x^3 \times x^2 = x \cdot x \cdot x \cdot x \cdot x = x^5$, the exponent of which 5 is equal to $3 + 2$, the sum of the exponents of the two factors. And the converse of this rule holds good, for if it is required to divide a power of a given quantity by any other power of the same quantity, it is only necessary to subtract the exponent of the divisor from the exponent of the dividend to obtain the exponent of their quotient. Thus, let it be required to divide

$$x^6 \text{ by } x^2, \text{ we have } x^6 \div x^2 = \frac{x \cdot x \cdot x \cdot x \cdot x \cdot x}{x \cdot x} = x \cdot x \cdot x \cdot x = x^4,$$

the exponent of which is equal to $6 - 2$.

Let us next examine the value of the power of a power; for instance, the square of x^3 . In this case, we see at once that the square of x^3 is nothing more than x^3 multiplied by itself, and

our former rule for the multiplication of powers, we have $x^3 \times x^3 = x^6$; if we had required the cube of x^3 , it would have been $x^3 \cdot x^3 \cdot x^3 = x^9$, and for every higher power of x^3 we must add another 3 to the exponent; it is therefore obvious, that as the exponent of the original power has to be taken as many times as the exponent of the power to which it has to be raised, that the new exponent will be equal to the product of the other two; thus, in the above examples, $3 \times 2 = 6$, therefore $(x^3)^2 = x^6$, and $3 \times 3 = 9$, therefore $(x^3)^3 = x^9$. The converse of this rule also holds good, for if it is required to extract any root of a power, we have only to divide the exponent of the power by the exponent of the root, to obtain the exponent desired. Thus the square root of x^4 is x^2 , because $4 \div 2 = 2$; and the square root of x^6 is x^3 , because $6 \div 2 = 3$.

The four processes which we have here described are those which are of the most frequent occurrence, and as it is essential that they should be perfectly comprehended before entering on the use of logarithms, we shall recapitulate them in the form of rules.

1. The multiplication of the powers of any quantity is performed by the addition of their exponents; that is, $x^n \times x^m = x^{(n+m)}$.

2. The division of the power of a quantity by any other power of the same quantity, is performed by subtracting the exponent of the divisor from the exponent of the dividend; that is, $x^n \div x^m = x^{(n-m)}$.

3. The involution of any power of a quantity to some power is performed by multiplying its exponent by the exponent of the power to which it is to be raised; that is, the n th power of x^m is, $x^{n \cdot m}$.

4. The extraction of the root of any power is performed by dividing its exponent by the exponent of the root required; that is, the n th root of x^m is $x^{\frac{m}{n}}$.

In the last example we have an exponent differing from any which we have previously met with, namely, a *fractional* exponent; its use, however, in that example sufficiently explains its meaning, which is, that the quantity to which it is attached is to be raised to the power denoted by the numerator of the fraction, and is then to have the root extracted, which is denoted by the denominator of the same; or, the processes may be reversed, and the root first extracted, and then the power raised, since the order in which these operations are performed makes no difference in the final re-

sult. For example, let x above equal 4, m equal 3, and n equal 2; then $x^{\frac{m}{n}} = 4^{\frac{3}{2}}$, and if we take the cube of 4, which equals 64, and extract its square root, we obtain 8; or, if we first extract its square root we obtain 2, the cube of which is also equal to 8. And therefore we perceive that the final result is the same, whichever process is first performed.

In the example to the second rule, namely, $x^{(n-m)} = x^r$; if m is less than n , then the exponent r is a *positive* number, and x^r is termed a *direct* power of x ; if, however, m exceeds n , then will r be a *negative* number, and in this case x^{-r} is termed an *inverse* power of x . In order to arrive at a correct idea of the value of an inverse power, we will take a direct power, and successively divide by its root, or subtract unity from its exponent, until we obtain a negative value; thus, let us start with x^3 , then—

$$x^{3-1} = \frac{x^3}{x} = x^2$$

$$x^{2-1} = \frac{x^2}{x} = x^1 = x$$

$$x^{1-1} = \frac{x^1}{x} = x^0 = 1$$

$$x^{0-1} = \frac{x^0}{x} = \frac{1}{x} = x^{-1}$$

$$x^{-1-1} = \frac{1}{x} \div x = \frac{1}{x^2} = x^{-2}$$

$$x^{-2-1} = \frac{1}{x^2} \div x = \frac{1}{x^3} = x^{-3},$$

or, in more general terms, $x^{-n} = \frac{1}{x^n}$; that is to say, *the inverse power of any number is equal to unity divided by the direct power with an equal exponent.*

This last rule holds equally, when the exponent of the inverse power is a fraction, as it does when an integer; thus, $x^{-\frac{1}{n}}$ is equal to unity divided by the n th root of x , or to $\frac{1}{x^{\frac{1}{n}}}$.

We have then four different forms in which an exponent may be presented.

1 The *positive integral* exponent, as x^n , which denotes the

2; it is requisite, however, for the purposes of general computation that we should know the logarithms of all the intermediate numbers included between these, as from 1 to 10, from 10 to 100, and so on. Now, since the logarithm of 1 is 0, and of 10 is 1, it follows that the logarithms of any intermediate numbers, greater than 1, but less than 10, must be some fraction, whose value lies between 0 and 1; and in like manner that, since the logarithm of 100 is 2, the logarithm of any intermediate number between 10 and 100, must have a value between 1 and 2. Interpolating, therefore, these fractional values of the logarithms of the intermediate numbers, we obtain the following series:—

Nos.	Logs.	Nos.	Logs.
1 = 10	0.00000	11 = 10	1.04139
2 = 10	0.30103	12 = 10	1.07918
3 = 10	0.47712	13 = 10	1.11394
4 = 10	0.60206	14 = 10	1.14613
5 = 10	0.69897	15 = 10	1.17609
6 = 10	0.77815	16 = 10	1.20412
7 = 10	0.84510	17 = 10	1.23045
8 = 10	0.90309	18 = 10	1.25527
9 = 10	0.95424	19 = 10	1.27875
10 = 10	1.00000	20 = 10	1.30103
		&c.	&c.

All numbers which are powers of 10, necessarily have integers for their logarithms, but the logarithms of all the intermediate numbers are compounded of an integer and a decimal fraction. The decimal portion is termed the *mantissa*, and the integer, which precedes it, is called the *index*, or *characteristic*; as, however, the former of these terms is frequently employed in a different sense, we shall here only use the latter.

In the foregoing Table, if we compare the logarithm of 2 with that of 20, we shall find that they only differ in the characteristic, the mantissa or decimal portion being identical in both; the reason of this will be very evident, if we consider that 20 is 2 multiplied by 10, and therefore that the logarithm of 20 is equal to the logarithm of 2, with that of 10 added to it, and, as the logarithm of 10 is an integral number, its addition only affects the value of the characteristic. In fact, the addition of 1 to the characteristic is multiplying the number which it represents by 10; in like manner, adding 2

to the characteristic, is multiplying the number by 100, and so on. Thus the logarithm

Of 2 is 0.30103;

Of $2 \times 10 = 20$ is $0.30103 + 1 = 1.30103$;

Of $2 \times 100 = 200$ is $0.30103 + 2 = 2.30103$;

Of $2 \times 1000 = 2000$ is $0.30103 + 3 = 3.30103$.

The mantissa, or the decimal portion of the logarithm, is always the same with the same figures, whether they are decimals or integers; it is only the *characteristic* which changes its value, with a change in the position of the decimal point. The value of the characteristic of the logarithm of a number is always one less than the number of integers in that number; thus, in the above example, when the number is 20 the characteristic is 1, when 200 it is 2, and when 2000 it is 3.

The characteristic, therefore, of the logarithms of all numbers

Equal to, or greater than 1, but less than 10, is 0,

"	"	10,	"	100,	"	1,
"	"	100,	"	1000,	"	2,
"	"	1000,	"	10000,	"	3,
		&c.		&c		&c.

By way of further illustration, we will take the number 67854, and successively divide it by 10, examining the change thus produced in the value of the corresponding logarithms:

Nos.	Logs.
67854	= 4.831576
6785.4	= 3.831576
678.54	= 2.831576
67.854	= 1.831576
6.7854	= 0.831576
.67854	= 0.831576 - 1
.067854	= 0.831576 - 2
.0067854	= 0.831576 - 3

We here perceive, as we have already stated, that, the figures remaining unaltered, no change takes place in the *mantissa* of the logarithm, but that as the number is successively divided by 10, the value of the *characteristic* is diminished by unity. We see further that, when the number is wholly a decimal fraction, the characteristic of its logarithm is *negative*; when the first figure after the decimal

point is a *significant figure**, the characteristic of its logarithm is -1 , when a nought is interposed after the decimal point, so that the first significant figure is the second decimal figure, the characteristic is -2 , with two noughts it is -3 , and generally, the characteristic of the logarithm of a decimal fraction is a negative number, greater by unity than the number of noughts following the decimal point. Instead of writing, as we have above, $0.831576 - 3$, the characteristic is placed to the left of the mantissa, with the negative sign *above* it, thus $\bar{3}.831576$. The negative sign is placed *above*, instead of *before* the characteristic, to denote that it is only the *characteristic* and not the mantissa that is negative. Thus, the characteristic of the logarithm of

.1	is $\bar{1}$,
.01	„ $\bar{2}$,
.001	„ $\bar{3}$,
.0001	„ $\bar{4}$.
&c	&c.

Since the characteristic of the logarithm of any number does not depend upon the value of the figures composing that number, and is so easily found by attention to the foregoing rules, it is usual to omit them altogether in the tables of logarithms, and only to give the mantissa or decimal portion.

It is only logarithms having 10 for their base which possess this important property, of having the same mantissa for the same figures, and this was the reason of that number being proposed by Briggs for the base of the common system of logarithms.

CHAPTER IV

Mode of calculating Logarithms, and Demonstration of their Properties.

IN the following Chapter the expressions, or formulæ employed for the calculation of logarithms, are mathematically deduced, and demonstrations are given of all the properties of logarithms referred to in any other portion of the work. By those not familiar with mathematical investigation, the present

* . . . the numerals are significant figures, with the exception of the cypher.

chapter may be omitted, as it is in nowise necessary to the proper understanding of the remainder of the work; the subject would, however, have been hardly complete without it, and it was considered that a rigid demonstration would be far more satisfactory to those by whom it could be followed, than a mere enunciation of the several propositions without any proof; and that, the reason of the several propositions and rules being understood, they would become much more firmly fixed in the memory, and their practical application and adaptation to peculiar cases rendered far more easy.

DEFINITIONS

1. The *Power* of a number or quantity, is the product arising from the multiplication of that number, any number of times by itself.

2. The *Root*, or *base* of a power, is the number or quantity, by the continual multiplication of which by itself, that power is produced.

3. The *Exponent*, or *index* of a power, is the number of times that the root of that power enters into it, as a factor.

4. The *Exponent*, or *index* of a root, is the number of times that it must be employed as a factor, to produce a given power.

5. A *Logarithm* of a number, to any base, is the index or exponent of the power to which that base must be involved, to be equal to the number.

6. A *System of Logarithms*, is the collection of the logarithms of a series of numbers, taken to the same base.

SCHOLIUM. The logarithm of any number, as x , to any base b , is expressed by $\log_b x$; in like manner, the logarithm of the same number, to any other base, as i , is written $\log_i x$.

7. A series of numbers is in *Arithmetical Progression*, when each number is derived from that which precedes it, by the *addition* of a constant number.

SCHOLIUM. Such a series is called an *Arithmetical Series*, and any one of the numbers composing it, a *term*.

8. The *Common Difference*, is the constant number, by the continual addition of which, an arithmetical series is formed.

9. A series of numbers is in *Geometrical Progression*, when each number is derived from that which precedes it, by the *multiplication* by a constant number.

SCHOLIUM. Such a series is called a *Geometrical Series*.

10. The *Common Ratio*, is the constant number, by

continual multiplication by which, a geometrical series is formed.

SCHOLIUM. In investigations similar to the following, the term *coefficient* is employed in a somewhat extended signification, to mean any quantity or expression (however complicated) by which the quantity, more immediately under consideration, is multiplied.

Thus, in the expression,

$$\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right)}{2} z^2 + \frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right) \cdot \left(\frac{r}{\lambda} - 2 \right)}{2.3} z^3,$$

the quantities $\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right)}{2}$ and $\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right) \cdot \left(\frac{r}{\lambda} - 2 \right)}{2.3}$

are looked upon as the coefficients of z^2 and z^3 respectively

11. The *Characteristic* of a Logarithm, is the integral number, to the left of the decimal point.

12. The *Mantissa* of a Logarithm, is the decimal number, to the right of the decimal point.

13. A *Significant Figure* is every figure but a cypher; the *cypher* signifying no actual quantity, but being employed only to determine the place of the other figures.

PROPOSITION A.

THEOREM. *In an equation of the form*

$$\begin{aligned} A + Bx + Cx^2 + Dx^3 + \dots + \&c. = \\ a + bx + cx^2 + dx^3 + \dots + \&c. \end{aligned}$$

the coefficient of any power of x on one side of the equation, is equal to the coefficient of the like power of x on the other side; that is, A = a, B = b, C = c, &c.

Because, in the above expression, the values of the coefficients are perfectly independent of the value of x , therefore, we may assume x to have any value we please, without destroying the equation.

Let, therefore, $x = 0$, the equation then becomes

$$A = a.$$

Now, since A and a are equal, we may remove them from the original equation, which then becomes

$$\begin{aligned} Bx + Cx^2 + Dx^3 + \dots + \&c. = \\ bx + cx^2 + dx^3 + \dots + \&c \end{aligned}$$

Dividing both sides by x , we obtain

$$\begin{aligned} B + Cx + Dx^2 + \dots + \&c. = \\ b + cx + dx^2 + \dots + \&c. \end{aligned}$$

And again, assuming $x = 0$, we have

$$B = b.$$

And in like manner, it may be shown that $C = c$, $D = d$, &c.

SCHOLIUM. 1. The above Theorem is true, whatever signs the terms of the equation may be affected with, provided only, that the terms involving like powers of x , on the opposite sides, are affected with like signs. Thus, it is true if

$$\begin{aligned} A - Bx + Cx^2 - Dx^3 + \dots - \&c. = \\ a - bx + cx^2 - dx^3 + \dots - \&c. \end{aligned}$$

or if,

$$\begin{aligned} -A + Bx - Cx^2 + Dx^3 - \dots + \&c. = \\ -a + bx - cx^2 + dx^3 - \dots + \&c. \end{aligned}$$

2. This Theorem also holds good when more complicated functions of x take the place of x , x^2 , x^3 , &c., provided only, that the same functions occur in the same order on opposite sides; as for example, if

$$\begin{aligned} A + Bx + Cx^2 + Dxy + Ey^2 + Fx^3 + \dots + \&c. = \\ a + bx + cx^2 + dxy + ey^2 + fx^3 + \dots + \&c \end{aligned}$$

PROPOSITION B.

PROBLEM. To expand b^λ in terms of λ .

For b , substitute $(1 + y)$, then $b^\lambda = (1 + y)^\lambda$; expanding this expression by the Binomial Theorem*, it becomes

$$\begin{aligned} b^\lambda &= 1 + \lambda y + \lambda \frac{(\lambda - 1)}{2} y^2 + \lambda \frac{(\lambda - 1) \cdot (\lambda - 2)}{2 \cdot 3} y^3 + \\ &\quad \lambda \frac{(\lambda - 1) \cdot (\lambda - 2) \cdot (\lambda - 3)}{2 \cdot 3 \cdot 4} y^4 + \dots + \&c. \\ &= 1 + \lambda y + \frac{\lambda^2 - \lambda}{2} y^2 + \frac{\lambda^3 - 3\lambda^2 + 2\lambda}{2 \cdot 3} y^3 + \\ &\quad \frac{\lambda^4 - 6\lambda^3 + 11\lambda^2 - 6\lambda}{2 \cdot 3 \cdot 4} y^4 + \dots + \&c. \end{aligned}$$

* For a demonstration of the Binomial Theorem, see the "Elements of Algebra," p. 148, by Mr. Haddon.

$$= 1 + \lambda y + \left(\frac{\lambda^2}{2} - \frac{\lambda}{2} \right) y^2 + \left(\frac{\lambda^3}{6} - \frac{3\lambda^2}{6} + \frac{2\lambda}{6} \right) y^3 + \\ \left(\frac{\lambda^4}{24} - \frac{6\lambda^3}{24} + \frac{11\lambda^2}{24} - \frac{6\lambda}{24} \right) y^4 + \dots + \&c.$$

Arranging this last expression according to the powers of λ , we have

$$b^\lambda = 1 + \lambda \left\{ y - \frac{1}{2} y^2 + \frac{1}{3} y^3 - \frac{1}{4} y^4 + \dots - \&c \right\} \\ + \lambda^2 \left\{ \frac{1}{2} y^2 - \frac{1}{2} y^3 + \frac{11}{24} y^4 - \dots + \&c \right\} \\ + \lambda^3 \left\{ \frac{1}{6} y^3 - \frac{1}{4} y^4 + \dots - \&c. \right\}$$

Or, if we put

$$A = \left\{ y - \frac{1}{2} y^2 + \frac{1}{3} y^3 - \frac{1}{4} y^4 + \dots - \&c. \right\}$$

$$B = \left\{ \frac{1}{2} y^2 - \frac{1}{2} y^3 + \frac{11}{24} y^4 - \dots + \&c. \right\}$$

$$C = \left\{ \frac{1}{6} y^3 - \frac{1}{4} y^4 + \dots - \&c. \right\}$$

we have

$$b^\lambda = 1 + A\lambda + B\lambda^2 + C\lambda^3 + \dots + \&c. \dots [1.]$$

Now, in order to obtain the values of the coefficients B, C, &c., in terms of A, let us put z for $A\lambda + B\lambda^2 + C\lambda^3 + \&c.$, then the above expression becomes

$$b^\lambda = 1 + z$$

Extracting the root on both sides, we have,

$$b = (1 + z)^{\frac{1}{\lambda}},$$

and raising them to the power of r , it becomes

$$b^r = (1 + z)^{\frac{r}{\lambda}}$$

Expanding by the Binomial Theorem, we have

$$b^r = 1 + \frac{r}{\lambda} x + \frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right)}{2} x^2 + \frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right) \cdot \left(\frac{r}{\lambda} - 2 \right)}{2.3} x^3 +$$

$$\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right) \cdot \left(\frac{r}{\lambda} - 2 \right) \cdot \left(\frac{r}{\lambda} - 3 \right)}{2.3.4} x^4 + \dots + \&c.$$

Substituting, in this expression, $A\lambda + B\lambda^2 + C\lambda^3 + \&c.$, for x , it becomes

$$b^r = 1 + \frac{r}{\lambda} (A\lambda + B\lambda^2 + C\lambda^3 + \&c.) +$$

$$\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right)}{2} (A\lambda + B\lambda^2 + C\lambda^3 + \&c.)^2 +$$

$$\frac{\frac{r}{\lambda} \left(\frac{r}{\lambda} - 1 \right) \cdot \left(\frac{r}{\lambda} - 2 \right)}{2.3} (A\lambda + B\lambda^2 + C\lambda^3 + \&c.)^3 + \dots + \&c.$$

$$= 1 + r(A + B\lambda + C\lambda^2 + \&c.) +$$

$$\frac{r(r-\lambda)}{2} (A + B\lambda + C\lambda^2 + \&c.)^2 +$$

$$\frac{r(r-\lambda) \cdot (r-2\lambda)}{2.3} (A + B\lambda + C\lambda^2 + \&c.)^3 + \dots + \&c.$$

If now we assume $\lambda = 0$, this expression becomes

$$b^r = 1 + Ar + \frac{A^2 r^2}{2} + \frac{A^3 r^3}{2.3} + \dots + \&c$$

Which expression, being perfectly general, is true whatever value is assigned to r ; we may therefore substitute λ for r , whence we obtain

$$b^\lambda = 1 + A\lambda + \frac{A^2}{2} \lambda^2 + \frac{A^3}{2.3} \lambda^3 + \dots + \&c. \dots \dots [2.]$$

The value of A is already known in terms of y , but as $b =$

1 + y, therefore $y = b - 1$, and if we substitute this value for y, we have

$$A = \left\{ (b-1) - \frac{1}{2}(b-1)^2 + \frac{1}{3}(b-1)^3 - \frac{1}{4}(b-1)^4 + \dots - \&c. \right\} \dots [3.]$$

PROPOSITION C.

PROBLEM. *From the equation*

$$b^\lambda = n = 1 + A\lambda + \frac{A^2}{2}\lambda^2 + \frac{A^3}{2.3}\lambda^3 + \dots + \&c$$

to determine the value of λ , in terms of b and n

If, in the equation $n = b^\lambda$, both sides are raised to the power of x , it becomes $n^x = b^{\lambda x}$; then expanding n^x in terms of x , we obtain (Prop. B, [2])

$$n^x = 1 + A_1 x + \frac{A_1^2}{2} x^2 + \frac{A_1^3}{2.3} x^3 + \dots + \&c.$$

in which (Prop. B, [3])

$$A_1 = \left\{ (n-1) - \frac{1}{2}(n-1)^2 + \frac{1}{3}(n-1)^3 - \dots + \&c. \right\}$$

Also expanding $b^{\lambda x}$ in terms of λx , we have (Prop. B, [2])

$$b^{\lambda x} = 1 + A\lambda x + \frac{A^2}{2}\lambda^2 x^2 + \frac{A^3}{2.3}\lambda^3 x^3 + \dots + \&c.$$

If now in the equation $b^{\lambda x} = n^x$, we substitute the values of $b^{\lambda x}$ and n^x obtained above, it becomes

$$1 + A\lambda x + \frac{1}{2}A^2\lambda^2 x^2 + \frac{1}{6}A^3\lambda^3 x^3 + \dots + \&c.$$

$$= 1 + A_1 x + \frac{1}{2}A_1^2 x^2 + \frac{1}{6}A_1^3 x^3 + \dots + \&c.$$

From which we have, by Prop. A,

$$A\lambda = A_1$$

$$A^2\lambda^2 = A_1^2$$

$$A^3\lambda^3 = A_1^3, \&c.$$

From each of which we obtain

$$\lambda = \frac{A_1}{A}$$

Substituting for A_1 its value given above, and for A its value determined in Prop. B, [3], we have

$$\lambda = \frac{(n-1) - \frac{1}{2}(n-1)^2 + \frac{1}{3}(n-1)^3 - \&c.}{(b-1) - \frac{1}{2}(b-1)^2 + \frac{1}{3}(b-1)^3 - \&c.} \dots [1.]$$

SCHOLIUM. Since $b^\lambda = n$, it follows, from the definition of logarithm, page 4, that λ is the logarithm of the number n the base b . Now as b may have any value that we please assigned to it, and, as every different value of b gives a different value of λ , it follows that there may be any number of arithms corresponding with the number n , because any number of values may be given to the base b^* .

We may therefore assume such a value for b as shall give

$$= \left\{ (b-1) - \frac{1}{2}(b-1)^2 + \frac{1}{3}(b-1)^3 - \&c. \right\} = 1, \text{ in}$$

each case the expression [1.] above for the logarithm becomes

$$= (n-1) - \frac{1}{2}(n-1)^2 + \frac{1}{3}(n-1)^3 - \dots + \&c. \dots [2.]$$

This is the value for A actually taken by Baron Napier, employed by him in his first Table of Logarithms, from each circumstance, logarithms calculated to this base are named *Napierean Logarithms*.

PROPOSITION D.

PROBLEM. *In the equation*

$$= 1 + A\lambda + \frac{A^2}{2} \lambda^2 + \frac{A^3}{2.3} \lambda^3 + \frac{A^4}{2.3.4} \lambda^4 + \dots + \&c.$$

determine the value of b , when A is made equal to unity.

Substituting the assumed value of A , in the above expression, it becomes

* See page 8.

PROPOSITION F.

PROBLEM. *To reduce the logarithms of a system having one base, to those having a different base.*

We have, in Prop. E, [1],

$$\log_b n = \frac{1}{A} \left\{ (n-1) - \frac{1}{2}(n-1)^2 + \frac{1}{3}(n-1)^3 - \dots + \&c. \right\}$$

In which expression the coefficient $\frac{1}{A}$ is constant for every logarithm having b for its base, its value being entirely independent of n (Prop. B, [3]); and we have further shown (Prop. D) that, when the base of the system of logarithms is taken equal to $2.718281828 = e$, the value of A is reduced to unity; in this case, therefore, we have

$$\log_e n = (n-1) - \frac{1}{2}(n-1)^2 + \frac{1}{3}(n-1)^3 - \dots + \&c. [1.]$$

This system, therefore, having e for its base, has been called the *natural* system of logarithms, because it can be expressed in terms of n alone, and has unity for its coefficient

Now, we have (Prob. B, [3])

$$A = (b-1) - \frac{1}{2}(b-1)^2 + \frac{1}{3}(b-1)^3 - \dots + \&c.,$$

an expression from which, by comparison with [1] above, we immediately perceive that $\log_b b = A$, or that the value of A .

the denominator of the constant coefficient $\frac{1}{A}$, for any system of logarithms to the base b , is equal to the Napierian logarithm of b . The constant coefficient $\frac{1}{A}$ is called the *modulus*

of the system to which it belongs; and to reduce logarithms having one base to those having a different one, it is only necessary to divide them by the modulus of their own system, by which they become reduced to natural, or Napierian logarithms, and then to multiply them by the modulus of the system having the required base $*$.

* See page 9.

PROPOSITION G.

PROBLEM. To find the Napierian logarithm of b , when b equals 10.

In the expression (Prop. E, [2])

$$\log_b \frac{a}{a-1} = \frac{2}{A} \left\{ \frac{1}{2a-1} + \frac{1}{3(2a-1)^3} + \frac{1}{5(2a-1)^5} + \dots + \&c. \right\}$$

if we put $a = 2$, and bear in mind that, as we want the Napierian logarithm, the modulus equals unity, we obtain

$$\log_2 \frac{2}{1} = \log_2 2 = 2 \left\{ \frac{1}{3} + \frac{1}{3 \cdot 3^3} + \frac{1}{5 \cdot 3^5} + \dots + \&c. \right\}$$

Performing the calculation, we have

$$\begin{aligned} \frac{1}{3} &= \cdot 333,333,333,333 \\ \frac{1}{3} \cdot \frac{1}{3^3} &= \cdot 012,345,679,012 \\ \frac{1}{5} \cdot \frac{1}{3^5} &= \cdot 000,823,045,208 \\ \frac{1}{7} \cdot \frac{1}{3^7} &= \cdot 000,065,321,053 \\ \frac{1}{9} \cdot \frac{1}{3^9} &= \cdot 000,005,645,029 \\ \frac{1}{11} \cdot \frac{1}{3^{11}} &= \cdot 000,000,513,184 \\ \frac{1}{13} \cdot \frac{1}{3^{13}} &= \cdot 000,000,048,248 \\ \frac{1}{15} \cdot \frac{1}{3^{15}} &= 000,000,004,646 \\ \frac{1}{17} \cdot \frac{1}{3^{17}} &= 000,000,000,436 \\ &\hline &346,573,590,209 \\ &2 \end{aligned}$$

$$\log_2 2 = 0.693,147,180,418.$$

Now, $4 = 2^2$, therefore $\log_2 4 = 2 \log_2 2 =$

$$1.386,294,360,836$$

Again, let us put $a = 5$, we have then

$$\log_2 \frac{5}{4} = 2 \left\{ \frac{1}{9} + \frac{1}{3 \cdot 9^3} + \frac{1}{5 \cdot 9^5} + \frac{1}{7 \cdot 9^7} + \dots + \&c. \right\}$$

and, performing the calculation, we have

$$\begin{aligned} \frac{1}{9} &= .111,111,111,111 \\ \frac{1}{3} \cdot \frac{1}{9^3} &= .000,457,247,371 \\ \frac{1}{5} \cdot \frac{1}{9^5} &= .000,003,387,017 \\ \frac{1}{7} \cdot \frac{1}{9^7} &= .000,000,029,869 \\ \frac{1}{9} \cdot \frac{1}{9^9} &= .000,000,000,286 \\ &\quad \underline{.111,571,775,654} \\ &\quad \quad \quad \underline{2} \\ \log_2 \frac{5}{4} &= .223,143,551,308 \end{aligned}$$

Now, the $\log_2 \frac{5}{4} = \log_2 5 - \log_2 4$; if, therefore, we add to

$\log_2 \frac{5}{4}$ the $\log_2 4$, as found above, we shall have

$$\begin{aligned} &.223,143,551,308 \\ &1.386,294,360,836 \\ &\hline &1.609,437,912,144 \end{aligned}$$

equal the $\log_2 5$; then, since $\log_2 5 + \log_2 2 = \log_2 10$, we have

$$1.609,437,912 + .693,147,180 = 2.302,585,092,$$

which is the true value of $\log_2 10$, to nine places of decimals.

PROPOSITION H.

THEOREM. *The logarithm of any number q to the base p , multiplied by the logarithm of p to the base q , is always equal to unity; that is, $\log_p q \cdot \log_q p = 1$.*

Let $\log_p q = l$, and $\log_q p = k$; then $p^l = q$, and $q^k = p$.

If the first of these, $p^l = q$, be raised to the power of k , we have

$$p^{l \cdot k} = q^k.$$

But $q^k = p$, therefore $p^{l \cdot k} = p$, and

$$l \cdot k = \log_p q \cdot \log_q p, \text{ must equal unity.}$$

PROPOSITION I.

PROBLEM. *To determine the value of $\log_b e$, e being the base of the Napierian system of logarithms.*

Comparing the expression for the value of A , given in the Scholium to Proposition C, with the formula [2] in the same, we see that A is the Napierian logarithm of b , or $e^A = b$; therefore $\log_b b = A$.

Now we have, from Theorem H,

$$\log_b b \cdot \log_b e = 1, \text{ or } A \cdot \log_b e = 1,$$

$$\text{Therefore } \log_b e = \frac{1}{A} = \frac{1}{2.302585092} = 434294482.$$

This is therefore the value of the modulus [Prop. F] of the common system of logarithms.

PROPOSITION K.

THEOREM. *If a series of logarithms to the same base are in arithmetical progression, the corresponding numbers will form a series in geometrical progression.*

That is, if in $b^{l_1} = n_1$, $b^{l_2} = n_2$, $b^{l_3} = n_3$, $b^{l_4} = n_4$, the values of the exponents of b are such that l_1, l_2, l_3, l_4 , form an arithmetical progression, then will n_1, n_2, n_3, n_4 , form a geometrical progression.

For, let d be the common difference of the arithmetical series, then

$$b^{l_2} = b^{l_1 + \delta} = b^{l_1} \cdot b^{\delta}$$

$$b^{l_3} = b^{l_2 + \delta} = b^{l_2} \cdot b^{\delta}$$

$$b^{l_4} = b^{l_3 + \delta} = b^{l_3} \cdot b^{\delta}$$

$$\&c. \quad \&c. \quad \&c.$$

Let $b^{\delta} = n_2$, then, substituting in the above for b^{δ} , b^{l_1} , b^{l_2} , b^{l_3} , &c., their equals n_1 , n_2 , n_3 , &c., we obtain

$$n_2 = n_1 \cdot n_2$$

$$n_3 = n_2 \cdot n_2$$

$$n_4 = n_3 \cdot n_2$$

$$\&c. \quad \&c.$$

Or, we see that each term of the series n_1 , n_2 , n_3 , &c., is equal to the preceding term *multiplied* by the constant quantity n_2 ; they are, therefore (Def. 9), in *geometrical progression*, n_2 being their *common ratio*

SCHOLIUM. It should be observed that, since $b^{\delta} = n_2$, δ , the *common difference* of the series of logarithms, is the logarithm of n_2 , the *common ratio* of the series of numbers.

PROPOSITION L.

PROBLEM. To deduce an expression for the limit of the increment of a logarithm, produced by any given increase in the corresponding natural number.

If, in the expression Prop. E [1], we put $\frac{1}{b} + 1$ for n , it becomes

$$\log\left(\frac{1}{b} + 1\right) = \frac{1}{A} \left\{ \frac{1}{b} - \frac{1}{2b^2} + \frac{1}{3b^3} - \frac{1}{4b^4} + \dots \&c. \right\} \dots [1].$$

$$\text{Now } \log\left(\frac{1}{b} + 1\right) = \log\left(\frac{1+b}{b}\right) = \log(b+1) - \log b.$$

equal the increment occasioned in the logarithm of b , by increasing its value by unity

In the expression $\left\{ \frac{1}{b} - \frac{1}{2b^2} + \frac{1}{3b^3} - \&c. \right\}$, the first term, $\frac{1}{b}$, is greater than the sum of all the succeeding terms, and therefore

$$\log \left(\frac{1}{b} + 1 \right) = \log (b + 1) - \log b < \frac{1}{A} \cdot \frac{1}{b} \dots [2]$$

That is, the difference between the logarithms of two numbers differing by unity, is less than the modulus of the system divided by the lesser of those numbers.

SCHOLIUM 1. In the common system of logarithms, the modulus $= \frac{1}{A}$ has been shown [Proposition I] to be equal to .434294482; in this case, therefore, we have

$$\log (b + 1) - \log b < \frac{.434294482}{b} \dots \dots \dots [3].$$

SCHOLIUM 2. In the case of the logarithms of several consecutive numbers, each greater by unity than the preceding, putting m for the modulus of the system, we have

$$\log (b + 1) - \log b < \frac{m}{b}$$

$$\log (b + 2) - \log (b + 1) < \frac{m}{b + 1}$$

$$\log (b + 3) - \log (b + 2) < \frac{m}{b + 2},$$

from which we see that, as the numbers increase, the *rate of increase* of their logarithms decrease; thus, the addition of unity to b increases its logarithm by $\frac{m}{b}$, while the addition of

unity to $b + 1$ increases its logarithm only $\frac{m}{b + 1}$; when, however, b is a large number, b and $b + 1$ are very nearly equal, and therefore the rate of increase of the logarithms may be considered as proportional to that of the correspond-

ing numbers, so long as the increment of the latter is small, as compared with the number itself.

PROPOSITION M.

THEOREM. *The sum of the logarithms of two numbers, is the logarithm of their product.*

Let $\lambda = \log_b m$, and $l = \log_b n$, then $b^\lambda = m$, and $b^l = n$

Now.

$$m \cdot n = b^\lambda \cdot b^l = b^{\lambda + l}.$$

And because

$$b^{\lambda + l} = m \cdot n,$$

therefore $\lambda + l$ is the logarithm of $m \cdot n$, to the base b ; or, the sum of the logarithms of m and n is the logarithm of their product.

PROPOSITION N.

THEOREM. *The logarithm of the quotient of two numbers is equal to the logarithm of the dividend, with the logarithm of the divisor subtracted from it.*

Let λ and l denote the same as in the foregoing proposition. Then

$$\frac{m}{n} = \frac{b^\lambda}{b^l} = b^{\lambda - l},$$

And because

$$b^{\lambda - l} = \frac{m}{n}$$

therefore $\lambda - l$ is the logarithm of $\frac{m}{n}$, to the base b ; or, the logarithm of the quotient of m divided by n , is equal to the logarithm of m , with the logarithm of n subtracted from it.

PROPOSITION O.

THEOREM. *The logarithm of any power of a number, is equal to the logarithm of that number, multiplied by the exponent of the power.*

Let $\lambda = \log_b m$, then

$$m = b^\lambda,$$

$$m^2 = b^\lambda \cdot b^\lambda = b^{2\lambda},$$

$$m^3 = b^\lambda \cdot b^\lambda \cdot b^\lambda = b^{3\lambda},$$

$$m^n = b_1^\lambda \cdot b_2^\lambda \cdot b_3^\lambda \dots b_n^\lambda = b^{n\lambda}$$

And because

$$b^{n\lambda} = m^n,$$

therefore $n\lambda$ is the logarithm of m^n to the base b ; or, *the logarithm of the n th power of m , is equal to n times the logarithm of m .*

PROPOSITION P

THEOREM. *The logarithm of any root of a number, is equal to the logarithm of that number, divided by the exponent of the root.*

Let $\lambda = \log_b m$, then $m = b^\lambda$; let the square root of $m = x$, and the logarithm of $x = l$, then

$$m = x \quad x = b^l = b^\lambda,$$

$$\text{therefore, } 2l = \lambda, \text{ and } l = \frac{\lambda}{2}$$

In like manner, if the cube root of $m = y$, and the logarithm of $y = p$, then

$$m = y \cdot y \cdot y = b^{3p} = b^\lambda;$$

$$\text{therefore, } 3p = \lambda, \text{ and } p = \frac{\lambda}{3}.$$

And generally, if the n th root of $m = x$, and the logarithm of $x = q$, then

$$m = x_1 \cdot x_2 \cdot x_3 \dots x_n = b^{nq} = b^\lambda;$$

$$\text{therefore, } nq = \lambda, \text{ and } q = \frac{\lambda}{n};$$

or, the logarithm of the n th root of m , is equal to the logarithm of m , divided by n .

in either of the other series may be immediately found, on inspection of the tables. The number given is termed the *argument* of the tables, and the number sought the *resultant*. Thus in the table a specimen of which is given at page 33, the numbers in the left-hand margin and at the head of the table are the *argument*, by which we are directed where to find the logarithms of those numbers, which logarithms are the *resultants*. When we thus seek in any column of a table for the argument by which to find some other number, we are said to *enter* that column with the argument. For example, if we are looking in the table at page 33 for the logarithm of 2565, we *enter* the column of numbers (distinguished by N at the top) with the *argument* 2565, and on the same line in the contiguous column we find the *resultant* 4090874, which is the logarithm required.

Tables of the Logarithms of Numbers exist under a great variety of forms, and are calculated to a greater or less number of decimal places, according to the purposes to which they are intended to be applied. For Astronomical and Trigonometrical calculations, where considerable accuracy is required, tables are used in which the logarithms are carried to seven places of decimals; for ordinary purposes tables of six places will be found ample; and even in many cases five places will be sufficient. We shall describe some of the best and most generally employed tables, to seven, six, and five places.

The best tables of the Logarithms of Numbers to seven places, are those by Babbage, although for general use we should recommend Hutton's, which contain logarithmic sines, tangents, &c., to the same number of places, also the natural sines and tangents, and a great variety of other tables which will be found of frequent use. We have given on the opposite page as a specimen of these tables, a portion of one page of the same.

N. 25500 L. 406 OF NUMBERS.											37
N.	0	1	2	3	4	5	6	7	8	9	D. Pro.
2550	4065402	5572	5742	5913	6083	6253	6424	6594	6764	6934	170
51	7105	7275	7445	7615	7786	7956	8126	8296	8466	8637	
52	8807	8977	9147	9317	9487	9658	9828	9998	0168	0338	
53	4070508	0678	0848	1018	1189	1359	1529	1699	1869	2039	
54	2309	2379	2549	2719	2889	3059	3229	3399	3569	3739	170
55	3909	4079	4249	4419	4589	4759	4929	5099	5269	5439	
56	5608	5778	5948	6118	6288	6458	6628	6798	6968	7137	
57	7307	7477	7647	7817	7987	8156	8326	8496	8666	8836	
58	9005	9175	9345	9515	9684	9854	0024	0194	0363	0533	169
59	4080703	0873	1042	1212	1382	1551	1721	1891	2060	2230	
2560	2400	2569	2739	2909	3078	3248	3417	3587	3757	3926	
61	4096	4265	4435	4604	4774	4944	5113	5283	5452	5622	
62	5791	5961	6130	6300	6469	6639	6808	6978	7147	7317	169
63	7486	7656	7825	7994	8164	8333	8503	8672	8841	9011	
64	9180	9350	9519	9688	9858	0027	0196	0366	0535	0704	
65	4090874	1043	1212	1382	1551	1720	1889	2059	2228	2397	
66	2567	2736	2905	3074	3243	3413	3582	3751	3920	4089	169
67	4259	4428	4597	4766	4935	5105	5274	5443	5612	5781	
68	5950	6119	6288	6458	6627	6796	6965	7134	7303	7472	
69	7641	7810	7979	8148	8317	8486	8655	8824	8993	9162	

inserted in an adjoining column (headed "Pro.," an abbreviation of Proportional Parts).

The numbers contained in these little tables are, as already explained, the increments of the logarithm for an increase in the *sixth* figure of the natural numbers, they express, however, the increments for the units in the *seventh* place of the natural number when divided by 10, or for the *eighth* when divided by 100. Thus, suppose the logarithm of 25608587 were required, we derive at once from the table the logarithm of the first five figures, to which we add the proper increment for each additional figure, derived from the little table in the right-hand column. Thus—

Log of	25608000	is	7.4083757
Increment for	500	„	85
„	80	„	13.6
„	7	„	1.19
Therefore the log of	<u>25608587</u>	„	<u>7.4083857</u>

These little tables of proportional parts are of equal service in finding the natural numbers corresponding with any given logarithm. Thus, if the logarithm given were 4.4074327, on looking in the table we see that the next less logarithm is 4.4074249, which corresponds with the natural number 25552; then subtracting the logarithm taken from the table, from the given logarithm, we obtain the difference, 78; looking in the second column of the table of Proportional Parts, we find against the next less difference, 68, the number 4, which is the sixth figure of the number required; we have still 10 left, to which adding a nought we obtain 100, and the nearest number in the table being 102, against which we find 6, that is the seventh figure required. The number answer ing to the logarithm 4.4074249 is therefore 25552.46.

In these and all the best tables of logarithms, the characteristic is omitted, the tables containing only the mantissa of the logarithm. The characteristic must be added in accordance with the rule given at page 11.

We next pass on to describe tables of logarithms to *six* decimal places. As a specimen, we have given a page from the "Mathematical Tables," forming the second part of the present work.

No. 240 L. 380.] LOGARITHMS OF NUMBERS. [No. 269 L. 431.]

N.	0	1	2	3	4	5	6	7	8	9	N.
240	380211	0392	0573	0754	0934	1115	1296	1476	1656	1837	240
1	2017	2197	2377	2557	2737	2917	3097	3277	3456	3636	1
2	3815	3995	4174	4353	4533	4712	4891	5070	5249	5428	2
3	5606	5785	5964	6142	6321	6499	6677	6856	7034	7212	3
4	7390	7568	7746	7924	8101	8279	8456	8634	8811	8989	4
5	9166	9343	9520	9698	9875	0051	0228	0405	0582	0759	5
6	390935	1112	1288	1464	1641	1817	1993	2169	2345	2521	6
7	2697	2873	3048	3224	3400	3575	3751	3926	4101	4277	7
8	4452	4627	4802	4977	5152	5326	5501	5676	5850	6025	8
9	6199	6374	6548	6722	6896	7071	7245	7419	7592	7766	9
250	7940	8114	8287	8461	8634	8808	8981	9154	9328	9501	250
1	9674	9847	0020	0192	0365	0538	0711	0883	1056	1228	1
2	401401	1573	1745	1917	2089	2261	2433	2605	2777	2949	2
3	3121	3292	3464	3635	3807	3978	4149	4320	4492	4663	3
4	4834	5005	5176	5346	5517	5688	5858	6029	6199	6370	4
5	6540	6710	6881	7051	7221	7391	7561	7731	7901	8070	5
6	8240	8410	8579	8749	8918	9087	9257	9426	9595	9764	6
7	9933	0102	0271	0440	0609	0777	0946	1114	1283	1451	7
8	411620	1788	1956	2124	2293	2461	2629	2796	2964	3132	8
9	3300	3467	3635	3803	3970	4137	4305	4472	4639	4806	9
260	4973	5140	5307	5474	5641	5808	5974	6141	6308	6474	260
1	6641	6807	6973	7139	7306	7472	7638	7804	7970	8135	1
2	8301	8467	8633	8798	8964	9129	9295	9460	9625	9791	2
3	9956	0121	0286	0451	0616	0781	0945	1110	1275	1439	3
4	421604	1768	1933	2097	2261	2426	2590	2754	2918	3082	4
5	3246	3410	3574	3737	3901	4065	4228	4392	4555	4718	5
6	4882	5045	5208	5371	5534	5697	5860	6023	6186	6349	6
7	6511	6674	6836	6999	7161	7324	7486	7648	7811	7973	7
8	8135	8297	8459	8621	8783	8944	9106	9268	9429	9591	8
9	9752	9914	0075	0236	0398	0559	0720	0881	1042	1203	9

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8	9
2433	17'8	35'6	53'4	71'2	89'0	106'8	124'6	142'4	160'2
2446	17'7	35'4	53'1	70'8	88'5	106'2	123'9	141'6	159'3
2460	17'6	35'2	52'8	70'4	88'0	105'6	123'2	140'8	158'4
2474	17'5	35'0	52'5	70'0	87'5	105'0	122'5	140'0	157'5
2488	17'4	34'8	52'2	69'6	87'0	104'4	121'8	139'2	156'6
2503	17'3	34'6	51'9	69'2	86'5	103'8	121'1	138'4	155'7
2517	17'2	34'4	51'6	68'8	86'0	103'2	120'4	137'6	154'8
2532	17'1	34'2	51'3	68'4	85'5	102'6	119'7	136'8	153'9
2547	17'0	34'0	51'0	68'0	85'0	102'0	119'0	136'0	153'0
2562	16'9	33'8	50'7	67'6	84'5	101'4	118'3	135'2	152'1
2577	16'8	33'6	50'4	67'2	84'0	100'8	117'6	134'4	151'2
2592	16'7	33'4	50'1	66'8	83'5	100'2	116'9	133'6	150'3
2608	16'6	33'2	49'8	66'4	83'0	99'6	116'2	132'8	149'4
2624	16'5	33'0	49'5	66'0	82'5	99'0	115'5	132'0	148'5
2640	16'4	32'8	49'2	65'6	82'0	98'4	114'8	131'2	147'6
2656	16'3	32'6	48'9	65'2	81'5	97'8	114'1	130'4	146'7
2672	16'2	32'4	48'5	64'8	81'0	97'2	113'4	129'6	145'7
2689	16'1	32'2	48'3	64'4	80'5	96'6	112'7	128'8	144'8

This table contains the logarithms of every number less than 10,000 to six places of decimals, and in their general form and arrangement are very similar to those just described. The natural numbers which form the argument of the table are given to four places, the first three being found in the left-hand column, and the fourth at the head of the table; the first three figures are also repeated in the last column, to facilitate the use of the tables. In the first column of resultants the whole six figures of the logarithm are given, but in the succeeding columns only the last four, the two initial figures being supplied from the first column. In these tables, a horizontal line is introduced to separate the logarithms which have different initial figures, the line being made to break, or step up, when the change in the initial figures occurs other than at the commencement of a line. Thus in the middle of the sixth line the initial figures change from 38 to 39, and this is indicated by the line thus 9875 | 0051, the former of these being 389875, and the latter 390051.

In these tables also the proportional parts are somewhat differently arranged. In Hutton's and other logarithmic tables, the line in which the difference changes its value is shown, but each line contains ten logarithms, and there is nothing to indicate between which of these logarithms the change occurs; in the tables now being described, the number corresponding with the logarithm at which the change takes place is given in the left-hand column, and on the same line will be found the proportional parts for each unit constituting the fifth figure of the natural number. Thus, let the logarithm of 246057 be required; here we obtain the logarithm of the first four figures at once from the body of the table, for the increment to be added for the other two figures we look in the table of proportional parts, and on the same line with the first four figures of the given number, and in the same column as the fifth figure of the same, we find the proportional part to be added for that figure, and on the same line and in the same column as the sixth figure, we find the proportional part, *which, having first been divided by ten, must be added for that figure.* Thus—

The log of	246000	is	5.390935
Increment for	50	„	88
„	7	„	12.32

Therefore the log of 246057 „ 5.391035

If the first four figures of the number are not exactly found in the first column of proportional parts, we must take the next less number. Thus, had the given number, whose logarithm was required, been 254371, we must have looked for the proportional part for the last two figures in the line having 2532 in the left-hand column, those being the next less numbers to 2543.

To find a number from its logarithm, the application of this table is very simple. We must take the next less logarithm in the upper part of the table, and the four first figures of the corresponding number will be obtained; we must then take the difference between the given logarithm and that found in the table, and, looking in the table of proportional parts, on the same line with the first four figures just found (or the next less to them), for the next less number to this difference, the figure at the head of the column in which it is found will be the *fifth* figure of the required number. Then, if the difference found in the table be taken from the difference sought for, and a nought be added, the number at the head of the column in which this second difference may be found (on the same line as before), will be the *sixth* figure of the required number. Thus, what is the natural number whose logarithm is 3.416369?

The given logarithm . . . = 3.416369

Next less logarithm . . . = 3.416308 = the log of 2608.

61 = 1st diff.

Next less diff. in table . . . = 49.8 = .3

112 = 2nd diff.

Nearest diff. in table . . . = 116 = .07

Therefore the number required is 2608.37

Again, what is the natural number whose logarithm is 5.394564?

The given logarithm . . . = 5.394564

Next less logarithm . . . = 5.394452 = log of 248000

112 = 1st diff.

Next less diff. in table . . . = 105 = 60

70 = 2nd diff. = 4

Therefore the required number is 248064

The next table of logarithms which we shall describe are those reprinted, under the superintendence of the Society for the Diffusion of Useful Knowledge, from the tables of Lalande, published in France. A specimen of these tables is given below.

3960'' = 1° 6' 0''			3990'' = 1° 6' 30''			4020'' = 1° 7' 0''		
Num.	Log.	D.	Num.	Log.	D.	Num.	Log.	D.
3960	.59770	10	3990	.60097	11	4020	.60423	10
3961	.59780	11	3991	.60108	11	4021	.60433	11
3962	.59791	11	3992	.60119	11	4022	.60444	11
3963	.59802	11	3993	.60130	11	4023	.60455	11
3964	.59813	11	3994	.60141	11	4024	.60466	11
3965	.59824	11	3995	.60152	11	4025	.60477	10
3966	.59835	11	3996	.60163	10	4026	.60487	11
3967	.59846	11	3997	.60173	11	4027	.60498	11
3968	.59857	11	3998	.60184	11	4028	.60509	11
3969	.59868	11	3999	.60195	11	4029	.60520	11
3970	.59879	11	4000	.60206	11	4030	.60531	10
3971	.59890	11	4001	.60217	11	4031	.60541	11
3972	.59901	11	4002	.60228	11	4032	.60552	11
3973	.59912	11	4003	.60239	10	4033	.60563	11
3974	.59923	11	4004	.60249	11	4034	.60574	10
3975	.59934	11	4005	.60260	11	4035	.60584	11
3976	.59945	11	4006	.60271	11	4036	.60595	11
3977	.59956	10	4007	.60282	11	4037	.60606	11
3978	.59966	11	4008	.60293	11	4038	.60617	10
3979	.59977	11	4009	.60304	10	4039	.60627	11
3980	.59988	11	4010	.60314	11	4040	.60638	11
3981	.59999	11	4011	.60325	11	4041	.60649	11
3982	.60010	11	4012	.60336	11	4042	.60660	10
3983	.60021	11	4013	.60347	11	4043	.60670	11
3984	.60032	11	4014	.60358	11	4044	.60681	11
3985	.60043	11	4015	.60369	10	4045	.60692	11
3986	.60054	11	4016	.60379	11	4046	.60703	10
3987	.60065	11	4017	.60390	11	4047	.60713	11
3988	.60076	10	4018	.60401	11	4048	.60724	11
3989	.60086	11	4019	.60412	11	4049	.60735	11
3990	.60097	11	4020	.60423	11	4050	.60746	11

They are only carried to five decimal places, and their arrangement is quite different from that of the tables already described. They contain the logarithms of every consecutive number from 1 to 10,000, the arguments and resultants being placed in parallel columns, and the differences between the logarithms being given in a third column on the right hand. In these tables no proportional parts of the differences are given for the several units in the fifth place of the natural number, but they have to be found by proportion in the manner explained at page 35.

Thus, suppose the logarithm of 39694 were required: we immediately find, from the table, the logarithm of 39690 to be 4.59868, but we know this to be too small, and we want the proportional part of the whole difference, 11, to be added for the four units in the fifth place of the natural number. Now, the difference, 11, corresponds with an increase of ten units in the fifth figure of the number, therefore, as 10 : 11 :: 4 : 4.4, which is the proportional part required. The rule, therefore, for finding the proportional parts is as follows:—Multiply the difference given in the third column by all the figures of the natural number, except the first four, and point off as many decimals in the product as there were figures in the multiplier, the integral portion will be the proportional part to be added to the logarithm. In the example above we have $11 \times 4 = 44$, the integer of which being added to 4.59868, gives 4.59872 for the logarithm of 39694.

Again, what is the logarithm of 403567? The logarithm of 403500 is 5.60584, and the difference, 11, being multiplied by 67, is 737, from which pointing off *two* decimals, leaves the integer 7 to be added; therefore, the logarithm of 403567 is 5.60591.

To find a number answering to a logarithm, from these tables, proceed as follows:—Look for the next less logarithm, and the number answering to it will be the first four figures of the number required. Then take the difference between this logarithm and the one given; to this difference add as many cyphers as additional figures are required, and divide by the difference given in the third column of the table, the quotient will be the figures to be added to the first four already derived from the tables; the position of the decimal point will be determined by the value of the characteristic.

For example, what is the number answering to the logarithm 3.60428?

$$\begin{array}{rcl}
 \text{Logarithm given} & = & 3.60428 \\
 \text{Next less logarithm} & = & 3.60423 = 4020 \\
 \hline
 & & 50 \div 10 = .5 \\
 & & \hline
 & & 4020.5 \\
 & & \hline
 \end{array}$$

Therefore 4020.5 is the number whose logarithm is 3.60428.

Again, what is the number answering to the logarithm 4.60719?

$$\begin{array}{rcl}
 \text{Logarithm given} & = & 4.60719 \\
 \text{Next less logarithm} & = & 4.60713 = 40470 \\
 \hline
 & & 600 \div 11 = 5.4 \\
 & & \hline
 & & 40475.4 \\
 & & \hline
 \end{array}$$

Therefore 40475.4 is the number whose logarithm is 4.60719.

Having described some of the principal tables, and explained the method of using them, it will be desirable to show how many figures may be relied upon as accurate, in the results obtained by tables of five, six, and seven decimal places.

Let us have the logarithm 3.17284 given to five places of decimals: now the real value of this logarithm, if expressed to a greater number of places, might, for aught that can be known, be anything between 3.172835 and 3.172845, and might therefore differ from the logarithm given by very nearly .000005; which then is the extreme limit of the difference which tables to five places will show; any difference less than this might occur without any change in the value of the logarithm, as given in the table.

It has been shown in Prop. L [3], page 27, that the difference between the logarithms of two numbers, which differ only by unity, is less than the modulus of the system divided by the lesser number, or, in the case of common logarithms, than .434294482 divided by the lesser number. Now, the

difference between the true logarithm and that given to five places may, as we have shown above, be nearly equal to $\cdot 000005$, which is therefore less than $\cdot 4342945$ divided by the number, or the number is less than $\frac{\cdot 4342945}{\cdot 000005} = 86858\cdot 9$

That is to say, that unless the number, whose logarithm is given, is less than 86859, its value cannot be determined with certainty beyond *four* figures; but that if less than 86859, the first *five* figures derived from the table will be true.

In a similar way it may be shown that, when working with tables of logarithms to six decimal places, the first *six* figures of the result may be depended upon if less than 868589, but if greater, only the first *five* figures must be kept. And in the case of logarithms to seven decimal places, if the result is less than 8685890, *seven* places will be accurate, but if greater, only *six*. Generally, in any tables of logarithms, the result obtained may be considered accurate to as many figures as there are decimal places in the logarithms, provided the mantissa of the logarithm is less than $\cdot 9388$, but if greater, then the result will only be accurate to one less number of figures than the decimals in the logarithm.

CHAPTER VI.

Logarithmic Arithmetic.

WE next proceed to the application of logarithms to the ordinary processes of arithmetic, and to illustrate and explain their general use for the purposes of calculation. The references following the rules show the proposition in Chapter IV., in which the rule is demonstrated.

TO FIND THE ARITHMETICAL COMPLEMENT OF A LOGARITHM.

By the *arithmetical complement* of a logarithm is meant the remainder left by the subtraction of the logarithm from 10. Thus the arithmetical complement of $3\cdot 241735$ is $10\cdot 000000 - 3\cdot 241735 = 6\cdot 758265$. Its great use is in division, as will be presently shown; for if, instead of subtracting a logarithm, we add its complement, and subtract 10, we obtain the same result. To find the arithmetical complement employ the following rule

RUDDIMENTARY TREATISE

RULE.—*Subtract the first right-hand significant figure from 10, and all the others (including the characteristic when positive) from 9; when the characteristic is negative, it must be added to 9*

EXAMPLES.

The arithmetical complement of 5.631642 is 4.368358
 " " 2.170630 " 7.829370
 " " 7.217034 " 10.782960
 " " 3.173680 " 12.826320
 " " 3.607218 " 6.392782
 " " 0.714000 " 9.286000

MULTIPLICATION.

RULE.—*To multiply two or more numbers together, add their logarithms, the sum will be the logarithm of their product (Prop. M).*

EXAMPLES.

Multiply 5631 by 42.

Logarithm of 5631 = 3.750586
 " 42 = 1.623249

5.373835
 5.373831 = log of 238500

40 = 2

Answer = 238502

Multiply 52, 734, and 6 together.

Logarithm of 52 = 1.716003
 " 734 = 2.865696
 " 6 = 0.778151

5.359850
 5.359835 = log of 229000

150 = 8

Answer = 229008

Multiply 61, 22, and 65 together.

Logarithm of 61 = 1.785330
 " 22 = 1.342423
 " 65 = 1.812913

4.940666 = log of 87230

DIVISION.

RULE.—To divide one number by another, subtract the logarithm of the divisor from the logarithm of the dividend, and the remainder will be the logarithm of the quotient (Prop. N).

EXAMPLES.

Divide 1164 by 4.

Logarithm of	1164 =	3.065953
"	4 =	0.602060
		<hr/>
		2.463893 = log of 291.
		<hr/>

Divide 116908 by 5314.

Logarithm of	116900 =	5.067815
Prop. part for	8 =	29.68
		<hr/>
Logarithm of	116908 =	5.067845
"	5314 =	3.725422
		<hr/>
		1.342423 = log of 22.
		<hr/>

Instead of subtracting the logarithm of the divisor we may add its arithmetical complement, the result, with 10 subtracted from the characteristic, will as before be the logarithm of the quotient. Thus, in the example above, the arithmetical complement of 3.725422, the logarithm of the divisor, is 6.274578, which added to 5.067845, gives 1.342423, the same answer as before. This method will be found very convenient where it is desired to divide one number by several others; we have, in such a case, only to add to the logarithm of the dividend, the arithmetical complement of the logarithms of the several divisors, and subtract from the characteristic as many tens as there were divisors, the result will be the logarithm of the quotient.

Divide 579416 by 4, 23, and 47.

Logarithm of . . .	579400 =	5.762978
Proportional part for	10 =	7.5
" "	6 =	4.5
		<hr/>
Logarithm of . . .	579416 =	5.762990
Arith. comp. of log of	4 =	9.397940
" "	23 =	8.638272
" "	47 =	8.327902
		<hr/>
		2.127104 = log of 134.
		<hr/>

PROPORTION, OR THE RULE OF THREE.

Questions in proportion, or the rule of three, may be solved with great facility with the aid of logarithms.

RULE.—Add together the logarithms of the two middle *u* and from their sum subtract the logarithm of the first; the remainder will be the logarithm of the fourth term quantity required. Or, instead of subtracting the logarithm of the first term, add its arithmetical complement and sub 10 from the characteristic.

EXAMPLES.

If 14 men, in 47 days, excavate 5631 cubic yards, what length of will it take them to excavate 47280 cubic yards?

$$\begin{array}{rcl}
 \text{Or, as } 5631 : 47 :: 47280 : ? \\
 \text{Logarithm of } . . . 47280 = 4.674677 \\
 \text{,, } . . . 47 = 1.672098 \\
 \hline
 \text{Logarithm of } . . . 5631 = 6.346775 \\
 \hline
 2.596189 = \log \text{ of } 394.616
 \end{array}$$

By the second method:—

$$\begin{array}{rcl}
 \text{Logarithm of } . . . 47280 = 4.674677 \\
 \text{,, } . . . 47 = 1.672098 \\
 \text{Arith. comp. of log of } 5631 = 6.249414 \\
 \hline
 2.596189 \text{ as before.}
 \end{array}$$

If an engine of 67 horses' power can raise from a reservoir 57,600 feet of water in a given time, what horses' power will be required to 8,575,000 cubic feet in the same time?

$$\begin{array}{rcl}
 \text{Or, as } 57,600 : 67 :: 8,575,000 : ? \\
 \text{Logarithm of } . . . 8,575,000 = 6.933234 \\
 \text{,, } . . . 67 = 1.826075 \\
 \hline
 \text{Logarithm of } . . . 57,600 = 8.759309 \\
 \hline
 3.998887 = \log \text{ of } 9974.4
 \end{array}$$

Or:—

$$\begin{array}{rcl}
 \text{Logarithm of } . . . 8,575,000 = 6.933234 \\
 \text{,, } . . . 67 = 1.826075 \\
 \text{Arith. comp. of log of } 57,600 = 5.239578 \\
 \hline
 3.998887 \text{ as before.}
 \end{array}$$

INVOLUTION AND EVOLUTION.

Involution is the process of raising a number to any power of itself, and evolution is the extraction of any root of a number; both these processes are very readily performed by means of logarithms.

RULE I.—*To raise a number to any power desired, multiply the logarithm of the number by the exponent of that power, and the product will be the logarithm of the power required.*

RULE II.—To extract any root of a number, divide the logarithm of that number by the exponent of the root, and the quotient will be the logarithm of the root required.

EXAMPLES.

What is the square of 745, the cube of 67, and the 7th power of 8?

$$\text{Logarithm of } 745 = 2.872156$$

$$\underline{5.744312} = \log \text{ of } 555025.$$

Logarithm of 67 = 1.826075₃

$$\underline{5.478225} = \log \text{ of } 300763.$$

Logarithm of 8 = 0.903090
7

$$\underline{\underline{6.321630 = \log \text{ of } 2097152.}}$$

What is the square root of 4225, the cube root of 6859, and the 6th root of 117649?

Log of $4225 = 3.625827 \div 2 = 1.812913 = \text{log of } 65.$

$$\text{Log of } 6859 = 3.836261 \div 3 = 1.278754 = \text{log of } 19.$$

$$\text{Log of } 117649 = 5.070588 \div 6 = 0.845098 = \text{log of } 7.$$

When the number to be involved to any power, or whose root is to be extracted, is a *fraction*, its characteristic will be *negative*; in this case, in multiplying the logarithm by any number, it must be borne in mind that the mantissa is positive, and therefore that any figures carried from the multiplication of the same, must be *deducted* from the characteristic, instead of being *added* to it.

EXAMPLE.

What is the square of .25, the cube of .058, and the 5th power of .9784.

Logarithm of .25 = $\bar{1}.397940$
2

$$\underline{\underline{\bar{2}.795880}} = \log \text{ of } .0625.$$

Logarithm of .058 = $\bar{2}.763428$
3

$$\underline{\underline{\bar{4}.290284}} = \log \text{ of } .000195112.$$

Logarithm of .9784 = $\bar{1}.990516$
5

$$\underline{\underline{\bar{1}.952580}} = \log \text{ of } .89656.$$

In dividing a logarithm with a *negative* characteristic by any number, if the characteristic is a multiple of that number, or is divisible by it, proceed to divide in the usual manner, remembering, however, that the new characteristic will be *negative*. Should the characteristic not be divisible by the number by which it is required to divide the logarithm, separate the mantissa from the characteristic, and add to each such a number as will make the characteristic divisible, then divide each of the sums by the number, and the quotient will be the characteristic and mantissa respectively of the logarithm required. The equal numbers added to the characteristic and mantissa, must of course be considered *negative* in the first case and positive in the other.

EXAMPLES.

What is the square root of .209

Logarithm of .209 = $\bar{1}.320146$

Adding -1 to the characteristic we have $\bar{2} \div 2 = \bar{1}$, the new characteristic, and adding 1 to the mantissa we have $1.320146 \div 2 = .660073$ for the new mantissa, therefore $\bar{1}.320146 \div 2 = \bar{1}.660073 = \log \text{ of } .45716 =$ the square root of .209.

What is the cube root of .000195112?

Logarithm of .000195112 = $\bar{4}.290284$

$\bar{4} + 2 = 6 \div 3 = \bar{2}$ for the characteristic, and $.290284 + 2 = .290284 \div 3 = .763428$ for the mantissa. Therefore, $\bar{4}.290284 \div 3 = \bar{2}.763428 = \log \text{ of } .058$.

The four operations just described, namely, Multiplication, Division, Involution, and Evolution, comprise actually the

whole of the processes in the performance of which logarithms are employed, and when the student is conversant with these, he will be able to apply logarithms in a variety of cases in which their use will be attended with the saving of immense labour.

As an exercise in the preceding rules, and more especially in their practical application, we shall give a variety of useful formulæ, logarithmically expressed, and illustrate their use by examples; at the same time, that they may not be merely exercises, but may prove useful for reference, we shall arrange and classify them under their proper heads. In the following formulæ the letter λ will be used to denote "logarithm of;" thus, λa , will mean the logarithm of a , or the quantity for which a stands; and $\lambda (x^2 + y)$ means twice the logarithm of the quantity inclosed within the parenthesis, or y added to the square of x . All the lineal dimensions are given in feet; all the superficial dimensions in square feet, all the solid dimensions in cubicfeet, and all the weights or pressures in avoirdupois pounds, unless where it is otherwise expressly stated.

INTEREST.

Simple Interest.—[1.] Add together the logarithms of the principal, the rate, and the time, and from the sum subtract 2; the remainder will be the logarithm of the interest.

Compound Interest.—[2.] Find the amount of £1 at the given rate of interest for the first term; this is called the *ratio*, and the logarithm of the ratio for such rates of interest as are likely to be used are given in the annexed table. Multiply the logarithm of the ratio by the time, and add to the product the logarithm of the principal; the sum is the logarithm of the amount.

Rate of Interest.	Logarithm of ratio.	Rate of interest.	Logarithm of ratio.
1	0043214	5½	0232525
1¼	0053950	5¾	0242804
1½	0064660	6	0253059
1¾	0075344	6¼	0263289
2	0086002	6½	0273496
2¼	0096633	6¾	0283679
2½	0107239	7	0293838
2¾	0117818	7¼	0303973
3	0128372	7½	0314085
3¼	0138901	7¾	0324173
3½	0149403	8	0334238
3¾	0159881	8¼	0344279
4	0170333	8½	0354297
4¼	0180761	8¾	0364293
4½	0191163	9	0374265
4¾	0201540	9¼	0384214
5	0211893	9½	0394141
5¼	0222221	9¾	0404045

MENSURATION.

Triangle.—Let a , b , and c be the three sides, $d = \frac{1}{2}(a + b + c)$, and λ equal the area; then

$$[3.] \lambda A = \frac{1}{2} \{ \lambda d + \lambda (d - a) + \lambda (d - b) + \lambda (d - c) \}.$$

Square.—[4.] The logarithm of the area equals twice the logarithm of one of the sides.

Rectangle.—[5.] The logarithm of the area equals the logarithm of the length added to the logarithm of the height.

Polygon.—Let l equal the length of one of the sides, n equal the number of sides, and A equal the area; then

$$[6.]* \lambda A = .39794 + 2 \lambda l + \lambda n + \lambda \tan \left(\frac{90n - 180}{n} \right) - 1.$$

Circle.—Let d equal the diameter, c equal the circumference, and a equal the area; then

$$[7.] \lambda d = .50285 + \lambda c - 1 = .60206 + \lambda a - \lambda c = .053455 + \frac{1}{2} \lambda a.$$

$$[8.] \lambda c = .49715 + \lambda d = .60206 + \lambda a - \lambda d = .550605 + \frac{1}{2} \lambda a.$$

$$[9.] \lambda a = .89509 + 2 \lambda d - 1 = .90079 + 2 \lambda c - 2 = .39794 + \lambda d + \lambda c - 1.$$

Circular arcs.—Let r equal the radius, m equal the measure of the arc in degrees, and l its length; then

$$[10.] \lambda l = .2418776 + \lambda r + \lambda m - 2.$$

Circular sectors.—Let d equal the diameter, and a equal the area, the other letters as in [10]; then

$$[11.] \lambda a = .69897 + \lambda r + \lambda l - 1 = .338456 + 2 \lambda d + \lambda m - 3.$$

Parabola.—Let x_1 and x_2 be two abscissæ, y_1 and y_2 the corresponding ordinates, and a equal the area; then

$$[12.] \lambda a = .823909 + \lambda x_2 + \lambda (2y_2) - 1.$$

$$[13.] \lambda y_2 = \frac{1}{2} (\lambda x_2 + 2 \lambda y_1 - \lambda x_1).$$

Ellipse.—Let t equal the transverse, and c the conjugate diameters, y equal any ordinate, and x_1, x_2 the corresponding abscissæ; also let a equal the area, and p equal the periphery; then

$$[14.] \lambda a = .89509 + \lambda c + \lambda t - 1.$$

$$[15.] \lambda p = .196118 + \lambda (t + c).$$

$$[16.] \lambda y = \lambda c + \frac{1}{2} \lambda x_1 + \frac{1}{2} \lambda x_2 - \lambda t.$$

Formulae [16] applies also in the case of the Hyperbola.

Parallelopipedon, prism, or cylinder.—[17.] The logarithm of the cubic contents equals the logarithm of the area of the base added to the logarithm of its perpendicular height.

Pyramid or Cone.—Let a equal the area of the base, h its perpendicular height, and s its solidity; then

$$[18.] \lambda s = .823909 + \lambda a + \lambda h - 1.$$

Sphere.—Let d equal the diameter, c equal the circumference, s equal the solidity, and σ the surface; then

$$[19.] \lambda \sigma = \lambda d + \lambda c = .696487 + 2 \lambda d = .502837 + 2 \lambda c - 1.$$

$$[20.] \lambda s = .719 + 3 \lambda d - 1 = .227372 + 3 \lambda c - 1.$$

* The logarithmic tan must here be taken to a radius equal unity, therefore 10 must be subtracted from the characteristic given in the tables.

Regular Bodies—Let l equal the length of any linear edge, s equal the solidity, σ equal the surface, and a and b , numbers obtained from the annexed table; then

$$[21.] \lambda \sigma = 2 \lambda l + a.$$

$$[22.] \lambda s = 3 \lambda l + b.$$

No. of sides.	Name.	a	b
4	Tetraëdron . . .	0·2385607	1·0713486
6	Hexaëdron . . .	0·7781513	0·0000000
8	Octaëdron . . .	0·5395906	1·6730624
12	Dodecaëdron . . .	1·3148301	0·8844056
20	Icosaëdron . . .	0·9375306	0·3387940

TRIGONOMETRY.

Plane Triangles.—[23.] *Given two sides of a triangle and an angle opposite to one of them, to find the angle opposite to the other one.* RULE:—To the logarithmic sine of the given angle add the arithmetical complement of the logarithm of the opposite side, and the logarithm of the other given side; the sum with 10 subtracted from it will be the logarithmic sine of the angle required.

[24.] *Given two angles and a side opposite to one of them, to find the side opposite to the other one.* RULE:—To the logarithm of the given side, add the arithmetical complement of the logarithmic sine of its opposite angle, and the logarithmic sine of the other angle; the sum with 10 subtracted will be the logarithm of the side required.

[25.] *When two sides and the included angle are given, to find the third side.* RULE:—To the logarithm of the difference of the given sides add the arithmetical complement of the logarithm of their sum, and the logarithmic tangent of half the sum of the angles opposite the given sides, and the sum with 10 subtracted will be the logarithmic tangent of half the difference of those angles. Then to the arithmetical complement of the logarithmic cosine of half the said difference, add the logarithmic cosine of half the sum of the same angles, and the logarithm of the sum of the given sides; the sum with 10 subtracted will be the logarithm of the third side required.

[26.] *When the three sides are given, to find the angles.* RULE:—To the arithmetical complement of the logarithm of the longest side, add the logarithm of the sum of the other two sides, and the logarithm of the difference of those sides; the sum with 10 subtracted from it is the logarithm of the difference of the segments of the base or longest side. Then half this difference added to half the base will equal the longer segment, and deducted from it will equal the shorter one.

Right-angled triangles.—Let h equal the hypotenuse, b equal the base, and p equal the perpendicular; then

$$[27.] \lambda h = \frac{1}{2} \lambda (b^2 + p^2).$$

$$[28.] \lambda b = \frac{1}{2} \lambda (h^2 - p^2) = \frac{1}{2} \lambda (h + p) + \frac{1}{2} \lambda (h - p).$$

$$[29.] \lambda p = \frac{1}{2} \lambda (h^2 - b^2) = \frac{1}{2} \lambda (h + b) + \frac{1}{2} \lambda (h - b).$$

MECHANICS.

Vis vivâ.—Let w equal the weight of a body, v its velocity in feet per second, and ∇ its vis vivâ; then

$$[30.] \lambda \nabla = 1.507732 + \lambda w + 2 \lambda v.$$

Action of gravity.—Let s equal the space passed over in t seconds, and v the velocity as above; then

$$[31.] \lambda s = .69797 = \lambda t + \lambda v - 1 = 2.205702 + 2 \lambda t - 1 \\ = .190238 + 2 \lambda v - 2.$$

$$[32.] \lambda v = 1.507732 + \lambda t = .30103 + \lambda s - \lambda t = .904881 + \frac{1}{2} \lambda s.$$

$$[33.] \lambda t = .492268 + \lambda v - 2 = .30203 + \lambda s - \lambda v \\ = .306649 + \frac{1}{2} \lambda s - 1.$$

Pendulums.—Let t equal the time in seconds of one vibration in a very small circular arc, and l the length; then

$$[34.] \lambda t = .251016 + \frac{1}{2} \lambda l.$$

Central forces.—Let w equal the weight of a body moving in a circle whose radius is r , with a velocity of v feet per second, and let f equal the centrifugal force; then

$$[35.] \lambda f = .492268 + 2 \lambda v + \lambda w - \lambda r - 2.$$

Arches.—Let R equal radius of curvature at crown, b equal breadth of arch, w equal vertical weight on every square foot of the key-stone, including its own weight, and P equal the thrust or horizontal pressure on the key-stone; then

$$[36.] \lambda P = \lambda R + \lambda b + \lambda w.$$

Also let d equal horizontal distance of center of gravity of half the arch from its springing, r equal the rise of the arch, and w equal the weight of half the arch; then

$$[37.] \lambda P = \lambda w + \lambda d - \lambda r.$$

Retaining walls.—Let h equal height of wall, P equal pressure against wall, acting horizontally at one-third of the height of the wall above its base, and b a number obtained from the annexed table; then

$$[38.] \lambda P = 2 \lambda h + b.$$

Material supported by wall.	b
Water	1.494850
Fine dry sand	1.194958
Loose shingle, perfectly dry	1.111867
Common earth, perfectly dry and pulverulent . . . . .	.945222
The same, slightly moistened, or in its natural state . . . . .	.747800
Earth, the most dense and compact. . . . .	.793301

Resistance of air.—Let a equal the area of a thin surface moving through water with a velocity equal v feet per second, and R equal the resistance; then

$$[39.] \lambda R = .230449 + 2 \lambda v + \lambda a - 2.$$

Resistance of water.—The notation being the same; then

$$[40.] \lambda R = .98945 + 2 \lambda v + \lambda a - 1.$$

HYDRAULICS.

Discharge through pipes.—Let d equal diameter in inches, Q equal quantity of water discharged in cubic feet per minute, l equal the length of the pipe, and h equal the head; then

$$[41.] \lambda d = \frac{1}{2} \{ 2 \lambda Q + .6515 + \lambda (l + 4.2 d) - \lambda h - 2 \}.$$

$$[42.] \lambda Q = \frac{1}{2} \{ 1.3485 + \lambda h + 5 \lambda d - \lambda (l + 4.2 d) \}.$$

$$[43.] \lambda l = 1.3485 + \lambda h + 5 \lambda d - 2 \lambda Q.$$

$$[44.] \lambda h = .6515 + 2 \lambda Q + \lambda (l + 4.2 d) - 5 \lambda d - 2.$$

Discharge through canals.—Let a equal sectional area of canal, p equal the wetted perimeter, l equal length, h equal corresponding fall, and v equal the velocity in feet per second; then

$$[45.] \lambda v = 1.961142 + \frac{1}{2} \{ \lambda a + \lambda h - \lambda p - \lambda l \}.$$

Discharge over weirs.—Let d equal the depth of water flowing over the weir, b equal its breadth, and Q equal the cubic feet discharged in a second; then

$$[46.] \lambda Q = .511883 + \lambda b + \frac{2}{3} \lambda d.$$

STRENGTH OF MATERIALS.

Tensile strength.—Let a equal area in square inches, w equal weight producing fracture, and A equal number in column 2 of annexed table; then

$$[47.] \lambda w = \lambda a + A.$$

Strength to resist Crushing.—Let a equal the area in square inches, w the weight producing fracture, and B numbers in column 3 of annexed table; then when the height of piece is between once and $4\frac{1}{2}$ times its diameter,

$$[48.] \lambda w = \lambda a + B.$$

Strength of Columns.*—Let w equal the breaking weight in tons, D equal external, and d internal diameter, both in inches, l equal the length, and C equal number in column 4 of annexed table; then when the column is solid, with both ends rounded, and its length not less than 15 times its diameter,

$$[49.] \lambda w = 3.6 \lambda D - 1.7 \lambda l + C.$$

* Professor Hodgkinson's Formulas.

When the column is *hollow*; then

$$[50.] \lambda w = \lambda (D^{2.5} - d^{2.5}) - 1.7 \lambda l - .059243 + 0.$$

When the column is *solid* with both ends *flat*, and the length is not less than 30 times the diameter; then

$$[51.] \lambda w = 3.6 \lambda D - 1.7 \lambda l + .471843 + 0.$$

When the column is *hollow*; then

$$[52.] \lambda w = \lambda (D^{2.5} - d^{2.5}) - 1.7 \lambda l + .473217 + 0.$$

Transverse strength of a rectangular bar.—Let b equal the breadth and d the depth, both in inches, l equal the length, w the breaking weight, and N the number in the fifth column of the annexed table; then

$$[53.] \lambda w = \lambda b + 2 \lambda d - \lambda l + N.$$

Transverse strength of Professor Hodgkinson's girder.—Let a equal area of bottom flange in inches, and d , w , and l have the same meaning as above; then

$$[54.] \lambda w = 3.685921 + \lambda a + \lambda d - \lambda l.$$

Deflexion.—Let δ equal the deflexion in inches with the weight w , and N equal the numbers in the sixth column of the annexed table; then

$$[55.] \lambda \delta = 3 \lambda l + \lambda w - \lambda b - 3 \lambda d - N.$$

Material.	A	B	C	D	E
Cast iron . . .	4.253338	5.032417	1.173186	3.310693	4.629338
Wrought iron . . .	4.770499	.....	1.414973	3.359836	4.761063
Steel	5.113943	.....	1.574031	.....	4.826910
Elm	3.988559	3.108565	.....	2.528917	3.209515
Oak	4.074816	3.586587	0.209515	2.745855	3.527501
Fir	3.977724	.....	0.068186	2.567026	3.428723

The following collection of examples apply to the foregoing formulæ, reference being made by the numbers in parentheses. Only a portion of the examples are worked out at length, but answers are given in every case.

EXAMPLES.

[1.] What would the interest at $4\frac{1}{2}$ per cent. upon £3653 for 7 years amount to?

$$\text{Logarithm of } 3653 = 3.562650$$

$$,, \quad 4.5 = 0.653213$$

$$,, \quad 7 = 0.845098$$

$$\hline 5.060961$$

2

$$\hline 3.060961 = \text{Log of } 1150.69.$$

∴ Answer is £1150 14s.

[2.] What would £364 put out at 6 per cent. compound interest yearly, amount to at the end of 23 years?

Log of ratio from table = 0.0253059

23

0.5820357

Logarithm of 364 = 2.561101

3.143137 = Log of 1390.39

∴ Answer is £1268 1s.

[2.] What would £100 amount to at the end of 50 years, put out to annual compound interest at 5 per cent. ?

Ans. £1146 15s.

[3.] The sides of a triangle are respectively 564, 373, and 746, what is its area?

Log of $d = \frac{1}{2}(564 + 373 + 746) = 2.925312$

Log of $(d - a) = (842 - 564) = 2.444045$

Log of $(d - b) = (842 - 373) = 2.671173$

Log of $(d - c) = (842 - 746) = 1.982271$

2)10.022801

5.011405 = Log of 102661.

Therefore the area required is 102661.

[4.] What is the area of a square, the length of one side of which is 56.24 feet?

Ans. 3162.94.

[5.] What is the area of a rectangle, the length of whose sides is 15.6 and 16.2?

Ans. 252.72.

[6.] What is the area of a polygon of 12 sides, each of which is 5.06 feet in length?

$$\frac{90^\circ - 180}{n} = 75^\circ$$

Logarithm of $l = 5.06 = 0.704151$

2

1.408302

Logarithmic tan of $75^\circ = 0.571948$

Logarithm of $n = 12 = 1.079181$

397940

3.457371

1.

Logarithm of area = 2.457371 = 286.663.

[6.] What is the area of an octagonal room, each side of which is 5 feet?

Ans. 120.71

[14 and 15.] What is the area and periphery of an ellipse whose conjugate diameter is 27 and its transverse diameter is 49?

Ans. Area is 1039.08; and periphery is 119.38.

[16.] In an ellipse whose two diameters are 51 and 38, what is the length of the ordinate corresponding with an abscissa of 20 feet?

Since $x_1 = 20$, $x_2 = 51 - 20 = 31$

$$\text{Log } x_1 = 20 = 1.301030$$

$$\text{Log } x_2 = 31 = 1.491362$$

$$\begin{array}{r} 2)2.792392 \\ \hline \end{array}$$

$$1.396196$$

$$\text{Log } c = 38 = 1.579784$$

$$2.975980$$

$$\text{Log } t = 51 = 1.707570$$

$$\text{Log } y = \underline{\underline{1.268410}} = 18.553 = \text{the ordinate required.}$$

[17.] What is the cubic contents of a cylinder whose diameter is 2.75 feet, and its height 6 feet? Ans. 35.637.

[18.] What is the cubic content of a cone whose diameter is 3.5 feet, and its height 5.42 feet? Ans. 34.764.

[19 and 20.] What is the spherical surface and the solidity of a sphere whose diameter is 5.734 feet?

Ans. Surface is 163.46 feet; solidity is 98.712 feet.

[21 and 22.] What is the surface and solidity of a tetraëdron, one of whose lineal edges is 7.31 feet, of an octaëdron whose lineal edge is 3.17, and of a dodecaëdron whose lineal edge is 5.69?

Ans. Tetraëdron, surface is 94.711 feet; solidity is 46.036 feet.

Octaëdron, surface is 34.81 feet; solidity is 15.005 feet.

Dodecaëdron, surface is 668.43 feet; solidity is 1411.7 feet.

[23 and 24.] In a plane triangle two of its sides are 7.3 and 6.92, and the angle opposite the longer side is $74^\circ 39'$, what are the remaining angles and the length of the other side?

Then by [23]

$$\text{Logarithmic sin of } 74^\circ 39' = 9.984224$$

$$\text{Arithm. comp. of log of } 7.3 = 9.136677$$

$$\text{Logarithm of } \dots 6.92 = 0.840106$$

$$\begin{array}{r} 19.961007 \\ \hline \end{array}$$

$$10.$$

$$\text{Log sine of angle op. other side} = \underline{\underline{9.961007}} = 66^\circ 4' 56''.$$

Then, since the three angles of a triangle are equal to 180° we have
D 8

$180^\circ - (74^\circ 39' + 66^\circ 4' 56'') = 39^\circ 16' 4''$ for the angle opposite the side yet to be found.

Then by [24]

$$\begin{array}{rcl} \text{Logarithm of} & . & . & . & 6.92 = & 0.840106 \\ \text{Arith. comp. of log sin of } 66^\circ 4' 56'' = & & & & 0.038993 \\ \text{Logarithmic sin of} & . & 39 & 16 & 4 = & 9.801366 \\ & & & & \hline & & & & 10.680465 \\ & & & & 10. \end{array}$$

$$\text{Logarithm of side required} \quad . \quad . \quad = \quad \underline{\underline{0.680465}} = 4.791.$$

Ans. The three sides are 4.791, 6.92, and 7.3, and the three angles opposite to each respectively are $39^\circ 16' 4''$, $66^\circ 4' 56''$, and $74^\circ 39'$.

[25 and 3.] Two sides of a triangular piece of ground measure 81.10 and 105.75, and the angle included between them is $47^\circ 52'$, what is the length of the other side, and the area of the piece of ground?

$$\begin{array}{rcl} \text{Log } (105.75 - 81.10) & . & . & . & = & 1.391817 \\ \text{Arith. comp. of log } (105.75 + 81.1) & . & = & 7.728507 \\ \text{Logarithmic tan of} & . & . & . & 66^\circ 4' = & 10.352778 \\ & & & & \hline & & & & 19.473102 \\ & & & & 10. \end{array}$$

$$\left. \begin{array}{l} \text{Log tan of half the difference of the angles} \\ \text{opposite the given sides} \end{array} \right\} \quad 9.473102 = 16^\circ 33' 14''.$$

$$\begin{array}{rcl} \text{Arith. comp. of log cos of } 16^\circ 33' 14'' = & & 0.018384 \\ \text{Logarithmic cosine of} & . & 66 & 4 & 0 = & 9.608177 \\ \text{Logarithm of} & . & . & . & (105.75 + 81.1) = & 2.271493 \\ & & & & \hline & & & & 11.898054 \\ & & & & 10. \end{array}$$

$$\text{Logarithm of third side} \quad . \quad . \quad . \quad = \quad \underline{\underline{1.898054}} = 79.08. \text{ Ans.}$$

Ans. And the area by [3] is 38355 square feet.

[26.] In a plane triangle whose sides are 27.3, 54.5, and 62, what are the angles opposite those sides respectively?

$$\begin{array}{rcl} \text{Arithmetical comp. of log of 62} & . & = & 8.207608 \\ \text{Log of} & . & . & . & (27.3 + 54.5) = & 1.912753 \\ \text{Log of} & . & . & . & (54.5 - 27.3) = & 1.434569 \\ & & & & \hline & & & & 11.554930 \\ & & & & 10. \end{array}$$

$$\left. \begin{array}{l} \text{Log of the difference of the seg-} \\ \text{ments of the base} \end{array} \right\} = \underline{\underline{1.554930}} = 35.886.$$

Therefore the larger segment is $31 + 17.943 = 48.943$, and the lesser segment is $31 - 17.943 = 13.057$.

Then by [23]

$$\begin{array}{rcl}
 \text{Logarithmic sine of } . \quad 90^\circ & = & 10.000000 \\
 \text{Arith. comp. of log of } 54.5 & = & 8.263603 \\
 \text{Logarithm of } . \quad 48.943 & = & 1.689691 \\
 \hline
 & & 19.953294 \\
 & & 10.
 \end{array}$$

$$\text{Log sine of angle opp. larger segment} = \underline{\underline{9.953294}} = 63^\circ 54' 4''.$$

Then $90^\circ - 63^\circ 54' 4'' = 26^\circ 5' 56'' =$ angle opposite side which measures 27.3. Again,

$$\begin{array}{rcl}
 \text{Logarithmic sine of } . \quad 90^\circ & = & 10.000000 \\
 \text{Arith. comp. of log of } 27.3 & = & 8.563837 \\
 \text{Logarithm of } . \quad 13.057 & = & 1.115843 \\
 \hline
 & & 19.679680 \\
 & & 10.
 \end{array}$$

$$\text{Log sin of angle opp. lesser segment} = \underline{\underline{9.679680}} = 28^\circ 34' 23''.$$

Then $90^\circ - 28^\circ 34' 23'' = 61^\circ 25' 37'' =$ the angle opposite the side which measures 54.5; and $28^\circ 34' 23'' + 63^\circ 54' 4'' = 92^\circ 28' 27'' =$ the angle opposite the longest side.

[27.] What is the length of the diagonal of a rectangle whose two sides are 34 and 53.2? Ans. 63.14.

[28.] A house is 47 feet in height, at what distance must the base of a ladder 53 feet long be placed from the house in order that the top of the ladder may just meet that of the house? Ans. 24.5 feet.

[30.] What is the vis vivâ of a railway train weighing 117 tons, and travelling at a rate of 33 miles per hour? Ans. 19,763,150,000.

[31.] A body having been falling freely by the action of gravity for 7.5 seconds, it is desired to know the space which it has fallen through. Ans. 903.28 feet.

[32 and 33.] A body falls under the influence of gravity from a height of 427 feet, what time will it occupy and what will be its final velocity, neglecting the resistance of the air?

Ans. It will occupy 4.1866 seconds, and acquire a velocity of 165.995 feet per second.

[34.] What length of time will a pendulum 34.7 inches in length be in making one vibration? Ans. 0.9416 seconds.

[35.] A body weighing 53 lbs. is whirled round in a circle whose radius is 15 feet, with a velocity of 12.7 feet per second, what is the strain upon the rope by which it is constrained to move in the circle? Ans. 17.703 lbs.

[36.] What is the horizontal pressure at the crown of an arch whose radius of curvature is 147.52 feet, whose breadth is 35 feet, and the vertical weight on each square foot at the key-stone is 974 lbs. ? Ans. 5,028.950 lbs.

[37.] In an iron bridge having a span of 212 feet, with a rise of 22½ feet, the weight of half the arch is 998 tons, and the distance of its center of gravity from the springing is 43 feet, what is the horizontal thrust of the arch?

Ans. 1907½ tons.

[38.] A retaining wall 37 feet in height supports a loose sandy soil, required the pressure which every foot in length of it has to sustain?

Ans. 21447 lbs.

[38.] What is the pressure against a sluice 20 feet wide, and having a depth of 7 feet water against it?

Ans. 30,012,360 lbs.

[39 and 40.] What resistance would a board whose area is 14·7 square feet experience in being moved through the air with a velocity of 17 feet per second, and what would be the resistance in water?

Ans. In air, 72·221 lbs.; in water, 4146·34 lbs.

[42.] What quantity of water will be discharged by a pipe 18 inches in diameter, 5371 feet long, and under a head of 75 feet?

$$\text{Log of } d = 18 = 1\cdot2552725$$

$$\text{Log of } h = 75 = 1\cdot8750613$$

$$\text{Log } (l + 4\cdot2d) = 5446\cdot6 = 3\cdot7361255$$

$$\text{Log of quantity per minute} = 2\cdot8818991 = 761\cdot9.$$

Ans. 761·9 cubic feet per minute.

[44.] What head will be required to force 350 cubic feet of water per minute through a pipe 15½ inches in diameter, and 3640 feet long?

Ans. 22·739 feet.

[45.] What is the velocity with which water will flow through a conduit, 15 feet wide at the surface, 4 feet deep, with the sides sloped at 1 to 1, and the inclination of the surface of the water in which is 6 inches per mile?

Ans. 1·383 feet per second.

[46.] What is the quantity of water flowing over a weir 127 feet long, when the surface of the river is 6 inches above the top of the weir?

Ans. 14593 cubic feet per second.

[47.] What weights would be requisite to tear asunder rods 2 inches square, of cast iron, wrought iron, oak, and fir?

Ans. Cast iron, 71,680 lbs.; wrought iron, 235,810 lbs.; oak, 47,520 lbs.; fir, 38,000 lbs.

[48.] What weight will be necessary to crush a block of cast iron 3 inches square?

Ans. 969,750 lbs.

[52.] What weight will be required to break a hollow column with flat

ends, the length of which is 37 feet, its external diameter 12 inches, and its internal diameter 10 inches?

$$\text{Log of } D = 12 = \begin{array}{r} 1.079181 \\ \hline 3.6 \end{array}$$

$$\underline{\underline{3.8850516}} = \text{log of } D^3 = 7674.6.$$

$$\text{Log of } d = 10 = \begin{array}{r} 1.000000 \\ \hline 3.6 \end{array}$$

$$\underline{\underline{3.6000000}} = \text{log of } d^3 = 3981.1$$

$$D^3 - d^3 = \underline{\underline{3693.5}}$$

$$\text{Log } (D^3 - d^3) = 3693.5 = \begin{array}{r} 3.567438 \\ 0 = 1.173186 \\ \hline 0.473217 \end{array}$$

$$\text{Log } l = 37 = 1.568202 \times 1.7 = \begin{array}{r} 5.213841 \\ \hline 2.6659434 \end{array}$$

$$\underline{\underline{2.547898}} = \text{log of } 353.1.$$

Therefore the answer is 353.1 tons.

[53.] A bar of cast iron 2 inches wide and 3 inches deep is laid upon supports 6 feet apart, what weight applied in the center would break it?

Ans. 6135 lbs.

[54.] What weight applied in the center will be required to break a girder of Professor Hodgkinson's form of section, in which the area of the bottom flange is 26 square inches, the depth 15 inches, and the distance between the supports 23 feet?

Ans. 82,273 lbs.

[55.] What deflexion will be produced in a bar of cast iron 2 inches wide, 3 inches in depth, and with a 6 feet bearing, by a weight of 2730 lbs. applied in the center?

Ans. .256 inch.

APPENDIX.

*Table of the Logarithms of every Prime Number
from 2 to 1000.*

Prime number.	Logarithm.	Prime number.	Logarithm.	Prime number.	Logarithm.	Prime number.	Logarithm.
2	3010300	191	2810334	439	6424645	709	8506462
3	4771213	193	2855573	443	6464037	719	8567289
5	6989700	197	2944662	449	6522463	727	8615344
7	8450980	199	2988531	457	6599162	733	8651040
11	0413927	211	3242825	461	6637009	739	8686444
13	1139434	223	3483049	463	6655810	743	8709888
17	2304489	227	3560259	467	6693169	751	8756399
19	2787536	229	3598355	479	6803355	757	8790959
23	3617278	233	3673559	487	6875290	761	8813847
29	4623980	239	3783979	491	6910815	769	8859263
31	4913617	241	3820170	499	6981005	773	8881795
37	5682017	251	3996737	503	7015680	787	8959747
41	6127839	257	4099331	509	7067178	797	9014583
43	6334685	263	4199557	521	7168377	809	9079485
47	6720979	269	4297523	523	7185017	811	9090209
53	7242759	271	4329693	541	7331973	821	9143432
59	7708520	277	4424798	547	7379873	823	9153998
61	7853298	281	4487063	557	7458552	827	9175055
67	8260748	283	4517864	563	7505084	829	9185545
71	8512583	293	4668676	569	7551123	839	9237620
73	8633229	307	4871384	571	7566361	853	9309490
79	8976271	311	4927604	577	7611758	857	9329808
83	9190781	313	4955443	587	7686381	859	9339932
89	9493900	317	5010593	593	7730547	863	9360108
97	9867717	331	5198280	599	7774268	877	9429996
101	0043214	337	5276299	601	7788745	881	9449759
103	0128372	347	5403295	607	7831887	883	9459607
107	0293838	349	5428254	613	7874605	887	9479236
109	0374265	353	5477747	617	7902852	907	9576073
113	0530784	359	5550944	619	7916906	911	9595184
127	1038037	367	5646661	631	8000294	919	9633155
131	1172713	373	5717088	641	8068580	929	9680155
137	1367206	379	5786392	643	8082110	937	9717396
139	1430148	383	5831988	647	8109043	941	9735896
149	1731863	389	5899496	653	8149132	947	9763500
151	1789769	397	5987905	659	8188854	953	9790929
157	1958997	401	6031444	661	8202015	967	9854265
163	2121876	409	6117233	673	8280151	971	9872192
167	2227165	419	6222140	677	8305887	977	9898946
173	2380461	421	6242821	683	8344207	983	9925535
179	2528530	431	6344773	691	8394780	991	9960737
181	2576786	433	6364879	701	8457180	997	9986952

Prime numbers are those which are not divisible by any other number, or which cannot be resolved into factors; thus 233 is a prime number, because it cannot be divided by any number without leaving a remainder, while 234 is not a prime number, it being divisible by 2 and other numbers. The logarithms of any number which is not a prime number may be readily found by adding together the logarithms of the several prime factors by the multiplication of which the number is produced. Thus the number 234 is produced by the multiplication of 2, 3, 3 and 13 (all prime numbers,) and the logarithms of those numbers being taken from the table and added together, the sum will be the logarithm of 234. For example—

$$\begin{array}{rcl} \text{Log of } 2 & = & 0.3010300 \\ \text{,, } 3 & = & 0.4771213 \\ \text{,, } 3 & = & 0.4771213 \\ \text{,, } 13 & = & 1.1139434 \end{array}$$

$$\text{Log of } 234 = \underline{\underline{2.3692160}}$$

Again, the number 578 is composed of the prime factors 2, 17, and 17; then

$$\begin{array}{rcl} \text{Log of } 2 & = & 0.3010300 \\ \text{,, } 17 & = & 1.2304489 \\ \text{,, } 17 & = & 1.2304489 \end{array}$$

$$\therefore \text{Log of } 578 = \underline{\underline{2.7619278}}$$

In this manner we are enabled by the foregoing table to find the logarithm (true to at least 6 figures) of any number which may be given, whether prime or otherwise; for if prime its logarithm will be found at once in the table, but if not prime its logarithm will then be found by taking the sum of the logarithms of its prime factors, as explained above.

Table by the aid of which the number answering to any logarithm can be found to six places.

		1	10	100	1000	10000	100000
1	0000000	0413927	043214	04341	0434	043	04
2	3010300	0791812	086002	08677	0869	087	09
3	4771213	1139434	128372	13009	1303	130	13
4	6020600	1461280	170333	17337	1737	174	17
5	6989700	1760913	211893	21661	2171	217	22
6	7781513	2041200	253059	25980	2605	261	26
7	8450980	2304489	293838	30295	3039	304	30
8	9030900	2552725	334238	34605	3473	347	35
9	9542425	2787536	374265	38912	3907	391	39

In the above table the arguments are natural numbers, and the resultants their logarithms. The first figures of the arguments are found in the top horizontal line, and the final or unit's figure of the same in the extreme left-hand column; the logarithm is found at the place of intersection, that is, on the same line with the final figure, and in the same column as the other figures of the natural number. In the five last columns only the final *significant* figures of the mantissa of the logarithms will be found in the table; as many cyphers must be added to the left of the figures given as are necessary to make up seven figures. Thus at the top of the fifth column we have 100, and on the fourth line we have 4, then the figures found at the place of intersection are 17337, to which adding two cyphers on the left hand to make up the seven figures, we have .0017337, which is the mantissa of the logarithm of 1004.

The manner of using the table is as follows:—Having given a logarithm of which it is desired to know the corresponding number, look among the resultants in the table for the next less number to the mantissa of the given logarithm, and write down the natural number corresponding with the logarithm taken from the table, subtract this logarithm from the mantissa given, and again look among the resultants in the table for the next less number to the remainder, noting the number among the arguments answering to it; then subtract the resultant from the remainder, and look again for the next less resultant to this remainder, and thus proceed until the given logarithm has been exhausted, that is, until no remainder is left, each time noting the natural numbers cor-

responding to the logarithms taken from the table. These numbers being then multiplied together, the product will be the natural number corresponding to the logarithm originally given. These numbers have been so arranged that their multiplication may be very readily performed.

EXAMPLE.—Of what number is 3·3574202 the logarithm?

Given logarithm . . . = 3574202

Next less log in table . . = 3010300 = log of 2

1st remainder = 563902

Next less logarithm. . . = 413927 = log of 11

2nd remainder. . . . = 149975

Next less logarithm . . = 128372 = log of 103

3rd remainder = 21603

Next less logarithm . . = 17337 = log of 1004

4th remainder = 4266

Next less logarithm . . = 3907 = log of 10009

5th remainder = 359

Next less logarithm . . = 347 = log of 100008

6th remainder = 12

Nearest logarithm . . = 13 = log of 1000003

Then $2 \times 11 \times 103 = 2266$, which has to be next multiplied by 1004, or by 1000 and by 4, thus

$$2266000 = 2266 \times 1000$$

$$9064 = 2266 \times 4$$

$$2275064$$

This again has to be multiplied by 10009,

$$22750640000$$

$$20475576$$

$$22771115576$$

This has again to be multiplied by 100008, but we need not retain more than 8 figures, and the remainder to the right may be cut off, and any figures in the multiplication by 8 which would fall under any of the figures so cut off may be omitted; to know how many figures thus to omit, point off as many figures from the right as there are figures before the number by which you are about to multiply, and perform the multiplication only upon the remaining figures, taking care, however, to carry to the multiplication of the first number whatever would have been carried from that of the last figure cut off. Thus, in the example, there being *five* figures before 8, the number by which we are going to multiply, we point off the *five* right hand figures, and only multiply 227 by 8; we add in, however, 6 carried from the multiplication of the 7 cut off

$$\begin{array}{r}
 227,71115 \\
 1822 \\
 \hline
 22,772937 \\
 68 \\
 \hline
 22773005 \\
 \hline
 \hline
 \end{array}$$

The last multiplication is by 1000003, and the answer is true to seven places, the real number being 2277·3. In the example above, as the figures to be multiplied by 1000003 are not affected by the addition of 1822, this need not have been performed until afterwards, as below

$$\begin{array}{r}
 227,71115 \\
 1822 \\
 68 \\
 \hline
 22773005 \\
 \hline
 \hline
 \end{array}$$

What is the number corresponding to the logarithm 1.8551071?

8551071	$7 \times 102 = 714000$
8450980 = log of 7	2142
<hr/>	<hr/>
100091	71,61,4200
86002 = log of 102	14923
<hr/>	2865
14089	643
13009 = log of 1003	<hr/>
<hr/>	7163203!
1080	<hr/>
869 = log of 10002	
<hr/>	
211	
174 = log of 100004	
<hr/>	
37 = log of 1000009	
<hr/>	

The number is 71632.

What is the number whose logarithm is 2.6103833?

6103833	101
6020600 = log of 4	4
<hr/>	<hr/>
83233	404000
43214 = log of 101	9636
<hr/>	<hr/>
40019	40,7,6,8600
38912 = log of 1003	8153
<hr/>	2038
1107	204
869 = log of 10002	<hr/>
<hr/>	40773995
238	<hr/>
217 = log of 100005	
<hr/>	
21 = log of 1000005	
<hr/>	

The answer is 407.74.

What is the number whose logarithm is 3.7797587?

7797587	1603
7781518 = log of 6	6
<hr/>	<hr/>
16074	60,18,0000
13009 = log of 1003	42126
<hr/>	<hr/>
3065	361
3039 = log of 10007	<hr/>
<hr/>	60222487
26 = log of 1000006	<hr/>
<hr/>	

The number required is 6022.248.

MATHEMATICAL TABLES.

EXPLANATION AND USE OF THE TABLES.

Tables I. and II.

Logarithms of Numbers.

As a description of the nature and properties of logarithms will be found in the preceding Part on Logarithms, and is not essentially requisite to their mere application to the purposes of calculation, we shall here only explain the method of using the accompanying tables.

By an inspection of Table II., which contains the logarithms of all numbers from 1 to 100, it will be seen that each logarithm consists of two distinct parts, separated by a decimal point; thus, the logarithm of 13 is 1.113943; the number to the left of the decimal point (or 1 in the above example) is called the *index* or *characteristic**, and its value depends *only* upon the *number of digits* in the quantity whose logarithm it is, without any regard to the *value* of that quantity, and it is always 1 less than that number of digits; thus in the example, the characteristic of the logarithm of 13, which contains two digits, is 1, or one less than that number; and it will be seen from the Table, that 1 is the characteristic of all the logarithms from 10 to 99, but that, for numbers below 10, the index is 0, and for 100 is 2, in each case 1 less than the number of digits in the quantity of whose logarithm it is the characteristic. The characteristic, therefore, of the logarithms of all numbers

equal to or greater than	1 and less than	10 is 0.
" "	10	" 100 " 1.
" "	100	" 1000 " 2.
" "	1000	" 10000 " 3.
" "	10000	" 100000 " 4.
	&c.	&c. &c.

* In order to avoid confusion from the use of the word *index* to signify two things, we shall throughout this work employ the term *characteristic* when speaking of logarithms, and *index* when speaking of roots or powers.

When the quantity is less than unity, the characteristic of its logarithm becomes negative, and its value is determined by the number of cyphers which occur between the decimal point and the first significant figure (the fraction being decimally expressed), and is always 1 greater than such number of cyphers; or it is equal to the difference in the number of figures in the numerator and decimal denominator; thus, the characteristic of the logarithm of

·1 or $\frac{1}{10}$	is $\overline{1}$.*
·01 „ $\frac{1}{100}$	„ $\overline{2}$ ·
·001 „ $\frac{1}{1000}$	„ $\overline{3}$ ·
·0001 „ $\frac{1}{10000}$	„ $\overline{4}$ ·
&c. &c.	&c.

The *decimal* part of the logarithm, or that lying to the right of the decimal point, is called the *mantissa*, and depends entirely on the *relative* value of the figures composing the quantity whose logarithm it is, and not at all upon the actual *numerical* value of that quantity; thus, in the example already given, the decimal part of the logarithm of 13 is ·113943, which is also the decimal part of the logarithm of 1·3, or 130, or 1300, for in each case the 1 and the 3 have the same *relative* value. So that the decimal portion of a logarithm is always the same for the same figures, and is not altered by the addition of any number of cyphers either to the right or to the left hand of those figures, or what is equivalent, by the multiplication or division of the quantity by 10, or any power of 10; it is only the characteristic of the logarithm which alters its value, 1 being *added* to the characteristic for every 10 by which the quantity is *multiplied*, or *subtracted* from it for every 10 by which the quantity is *divided*. Thus,

the logarithm of 745800	being 5·872622
that of 74580	is 4·872622
„ 7458	„ 3·872622
„ 745·8	„ 2·872622
„ 74·58	„ 1·872622
„ 7·458	„ 0·872622
„ ·7458	„ $\overline{1}$ ·872622
„ 0·7458	„ $\overline{2}$ ·872622
„ ·007458	„ $\overline{3}$ ·872622

* The negative sign (—) is always placed *above* the characteristic, thus $\overline{2}$, instead of before it, in order to avoid its being misunderstood for the sign of subtraction.

It must be borne in mind, that in the logarithm of a fractional quantity, it is only the *characteristic* which has a *negative* value, and that the decimal part of a logarithm is always positive. It is, however, sometimes convenient to have the whole logarithm expressed, negatively, both characteristic and decimal; for which purpose, subtract the last right hand figure in the decimal portion from 10, and all the others from 9, and the result will be what is termed the *arithmetical complement* of the decimal, to which prefix the former characteristic less 1, and the result will be a negative logarithm, equivalent in value to the original logarithm having only a negative characteristic; for example, the logarithm of .07458, as above, is $\bar{2}.872622$, which is equivalent to -1.127378 . It is also frequently convenient to take the *arithmetical complement* of the whole logarithm, and this is obtained by subtracting the right hand figure of the decimal from 10, and all the others from 9, including the characteristic when *positive*, but if *negative* it must be *added* to 9. Thus, the arithmetical complement

of 3.146128 is 6.853872
 „ $\bar{2}.076276$ „ 11.923714
 „ $\bar{5}.322839$ „ 14.677161
 „ $\bar{1}.986772$ „ 10.013228

USE OF THE TABLES.

To find the logarithm of any given number.

If the number is less than 100, its logarithm will be found in Table II., with its proper characteristic prefixed; but if the number contains more than two figures, its logarithm may be found from Table I. as follows:—If there are only three figures in the number, look for that number in the first column of the table, and on the same line in the next column to the right, under 0, will be found the decimal portion of the required logarithm, to which the proper characteristic must be prefixed, according to the rules which we have just explained. If the quantity contains four figures, look for the first three figures in the first column as before, and the four last figures of the logarithm of the required number will be found on the same line with those three figures, and in that column which has at its head the fourth figure of the given number; the two first figures of the logarithm will be found in the second column (headed 0), and which figures being common to all the logarithms inclosed by each pair of horizontal lines, it is

unnecessary to repeat. Where these first figures change their value in the middle of a line, the same is indicated by a break in the horizontal line, thus, 139379 [0194, which shows that the two first figures (13) have changed to 14, and the right hand logarithm is therefore 140194

Examples.

Required the logarithm of 734.

In Table I., on the same line with 734 and under 0, are found 5696, the four last figures of the logarithm, to which the *common* figures 86 and the proper characteristic 2 being prefixed, we obtain 2·865696, the logarithm required.

Find the logarithm of 3476.

Here, on the same line with 347 and under 6, will be found 1080, which, with the two first figures and the characteristic prefixed, is 3·541080, the logarithm required.

The log. of 5·84 is 0·766413

„ 0932 „ 2·969416

„ 10·24 „ 1·010300

„ 3708 „ 3·569140

When the quantity whose logarithm is required contains more than four figures, proceed as follows:—Find the logarithm for the first four figures as above, then look in the first column of the Table of Proportional Parts, at the lower part of each page, for the first four figures, and on the same line in the column having at its head the fifth figure will be found the quantity which must be added to the logarithm already taken out, to give the logarithm of the quantity first required. If the first four figures are not found in the first column of the table, then take the line containing the next *less* number to it. If the number whose logarithm is required contains more than five figures, proceed as above to obtain the logarithm of the first five figures, then, on the same line of the Table of Proportional Parts that the number added to the logarithm for the fifth figure was found, and in the column having at its head the sixth figure, will be found a quantity which, divided by 10 (or what is the same, having its right hand figure taken away*), and added to the logarithm already found, will give the logarithm of the first six figures; again, on the same line and in the column having at its head the

* If the figure thus cut off exceeds five, one must be added to the last right hand figure left.

seventh figure, will be found a quantity which, divided by 100 (or having two figures cut off from the right hand), and added, will give the logarithm for seven figures*.

Examples.

Required the logarithms of 11488, 621547, 768651, 7642·179.

$$\begin{array}{rcl} \text{Log. of 11480 from Tab. I.} & = & 4\cdot059942 \\ \text{From Table of Proportional Parts on line} & & \\ \text{with 1148 and under 8} & \} & = 302 \quad 4 \end{array}$$

$$\text{Logarithm of 11488, as required} = \underline{\underline{4\cdot060244}}$$

$$\begin{array}{rcl} \text{Log. of 621500.} & = & 5\cdot793441 \\ \text{From Table of Proportional Parts, on line} & & \\ \text{with 6160, the next less No. in the} & & \\ \text{table to 6215, and under 4} & \} & = 28 \\ \text{On same line under 7} & = & 4 \quad 9 \end{array}$$

$$\text{Logarithm of 621547} = \underline{\underline{5\cdot793474}}$$

$$\begin{array}{rcl} \text{Log. of 768600.} & = & 5\cdot885700 \\ \text{From Table of Proportional Parts on} & & \\ \text{same line with 7686 and under 5} & \} & = 28 \\ \text{On same line under 4} & = & 2 \quad 2 \end{array}$$

$$\text{Logarithm of 768654} = \underline{\underline{5\cdot885730}}$$

$$\begin{array}{rcl} \text{Log. of 7642} & = & 3\cdot883207 \\ \text{From Table of Proportional Parts on} & & \\ \text{same line with 7552 and under 1} & \} & = 5 \quad 7 \\ \text{On same line under 7} & = & 3 \quad 99 \\ \text{On same line under 9} & = & 513 \end{array}$$

$$\text{Logarithm of 7642·179} = \underline{\underline{3\cdot883217}}$$

To find the number answering to any given logarithm.

Look in the upper portion of Table I. for the given logarithm, or the next less in value to it that can be found, then

* See remark at page 75 with regard to the number of places to be depended upon.

on the same line, in the first column, will be found the first three figures, and at the head of the column in which the logarithm was found, the fourth figure of the number sought. If the given logarithm is found exactly in the table, the figures thus obtained will be the required number, care being taken to point off one more figure to the left hand than there are units in the characteristic of the given logarithm, cyphers being attached to the right hand of the number, if requisite. If, however, the given logarithm is not found exactly in the table, subtract from it the next less logarithm found, calling the remainder the first difference; then look in the Table of Proportional Parts on the same line with the four figures already obtained from Table I. (or the next less figures which can be found) for this difference, and at the head of the column in which it is found will be the fifth figure of the number sought. If the first difference is not found exactly in the table, look for the next less number to it, which subtract from the first difference for the second difference; then add a cypher to this second difference, and look for it on the same line of the Table of Proportional Parts, as before, and the figure at the head of the column containing the nearest number to it, either greater or less, will be the sixth figure of the number required.

Examples.

Required the number answering to the logarithm 3.241756.

Given log. = 3.241756

Next less log. in Table I. = 3.241546 = the log. of 1744

210 first dif

In Table of Prop. Parts	}	199 is found in col. 8	·8
on same line with the next less No. to 1744			

110 second dif.

On the same line . . .	99 is found in col. 4	·04
------------------------	-----------------------	-----

The No. required = 1744·84

In this example the next less logarithm which can be found in Table I. is 3.241546, the number answering to which, 1744, is the first four figures of the number sought; then subtracting this logarithm from the given logarithm, we obtain for the first difference 210, and looking in the Table of Proportional

Parts on a line with 1740 (the next less number to 1744), for the next less number to 210, we find 199, at the head of the column containing which is 8, the fifth figure required; then, subtracting 199 from 210, we obtain the second difference, 11, and adding a cypher, the nearest number which we find on the same line is 99, at the head of the column containing which is 4, the sixth figure required.

Required the numbers answering to the following logarithms:—3·510009, 2·475771, 5·871624.

The number answering to the logarithm 3·510009 is found at once to be 3236.

Given log. = 2·475771		
Next less log. = 2·475671 = the log. of 299·0		
<hr/>		
100 = 1st dif.		
From Table of Proportional Parts	87	·06
<hr/>		
130 = 2nd dif.		
	130	·009
<hr/>		
No. required =		<u>299·069</u>

Given log. = 5·871624		
Next less log. = 5·871573 = the log. of 744000·		
<hr/>		
51 = 1st dif		
From Table of Proportional Parts	46	80·
<hr/>		
50		
	52	9·
<hr/>		
The No. required =		<u>744089·</u>

It should be observed here, that the number of figures which may be depended upon in any result obtained by logarithms, will be equal to the number of decimal places in the logarithms employed; thus, in using the tables appended to this work, the results obtained will be accurate to six figures, except towards the end of the tables, in which only five figures should be trusted.

Tables III., IV., and V.

Trigonometrical Tables.

Mathematicians have computed the lengths of the sines, tangents, and secants (assuming unity for the radius) corresponding to arcs from 1 minute of a degree, through all the gradations of magnitude, up to a quadrant, or 90° ; and the results of the computations are arranged for use in tables called *Trigonometrical Tables*. As, however, these quantities have to be carried to several places of decimals in order to obtain sufficiently accurate results, their use in calculations is attended with much labour, and therefore it is usual to employ their logarithms instead; but in this case the assumed radius is taken as 10,000,000,000 instead of unity, since with the latter most of the quantities would be *fractional*, and therefore have *negative* characteristics, the use of which would be inconvenient, and is superseded by taking the radius as above.

Table V. is such a table of the logarithms of the sines, cosines, tangents, cotangents, secants, and cosecants, for every minute from 1 minute to 90 degrees, calculated to a radius of 10,000,000,000 as above. It will be observed that the headings of the columns run along the *tops* of the pages as far as the 45th degree, after which they return along the *bottoms* of the pages in contrary order, as below:—

Sin	D.	Cosec	Tan	D.	Cot	Sec	D.	Cos
Cos	D.	Sec	Cot	D.	Tan	Cosec	D.	Sin

The reason of this will be apparent, if we only consider that the cos, cot, or cosec of an arc is the sin, tan, or sec of the *complement* of that arc. The intermediate columns, headed D, contain the differences of the consecutive logarithms in the contiguous columns on either side; it will be seen that the same difference is common to the sin and cosec, the tan and cot, and the sec and cos; since, from Table XXI.,

$$\sin = \frac{1}{\csc}, \text{ or } 1 = \sin \cdot \csc; \tan = \frac{1}{\cot}, \text{ or } 1 = \tan \cdot \cot;$$

$$\sec = \frac{1}{\cos}, \text{ or } 1 = \sec \cdot \cos; \text{ and consequently, } \log \sin + \log$$

$$\csc = \log \tan + \log \cot = \log \sec + \log \cos = 2 \log \text{rad} = 20;$$

therefore as the sin, tan, or sec increases, so must the corresponding cosec, cot, or cos diminish, and their differences

must be equal. The differences of the sines and tangents are not inserted on the two first pages, for the reason explained at page 78.

USE OF TABLE V.

To find the logarithmic sine, tangent, &c., of a given arc.

If the arc contains only degrees and minutes, its sin, tan, &c., will be found simply by inspection, by looking along the top or bottom of the tables for the degrees, and then in the first or last vertical column for the minutes, according as the number of degrees is less or greater than 45° ; and on the same line, in the column having for its title (either at the top or bottom, according as the degrees were found) the name of the trigonometrical quantity required, its log will be found.

If the arc contains seconds as well, the logarithm must be found as above for the degrees and minutes; then take the number in the contiguous column headed D on the same line, multiply it by the number of seconds, and divide by 100 (which is done by cutting off the two last figures); the quotient must then be added to or subtracted from the log already taken out, according as the same would be increased or decreased by an increase in the arc.

Examples.

1. Find the log sin of $37^\circ 47'$.

As the arc is less than 45° , by looking along the top of the table for the degrees, and in the first column for the minutes, we find in the column having at its top the word sin the figures 9.787232, which is the log sin of the arc required.

2. Find the log tan of $75^\circ 34'$.

Here, as the arc is greater than 45° , looking at the bottom of the tables for the degrees, and in the last column for the minutes, we find in the column having tan at the bottom, 10.589431, the tan of $75^\circ 34'$.

3. Find the log sin of $31^\circ 45' 5''$.

The log sin of $31^\circ 45'$ is 9.721162
The No. in col. D is $340 \times 5'' \div 100 = +$ 17

\therefore The log sin of $31^\circ 45' 5'' =$ 9.721179

4. Find the log cos of $25^\circ 1' 47''$.

The log cos of $25^\circ 1'$ is 9.957217
The No. in col. D is $98 \times 47'' \div 100 = -$ 47

\therefore The log cos of $25^\circ 1' 47'' =$ 9.957170

To find the arc corresponding to any given log sin, tan, &c.:
 —Look in Table V. for the given log sin, &c., or the next less log thereto, and on the same line will be found the minutes, and at the top or bottom of the page the degrees, of the arc required; if the log thus found is less than the given log, subtract the former from the latter, add two cyphers to the right of the remainder, and divide it by the number found in the contiguous column headed D; the quotient will be the number of seconds to be added to the degrees and minutes in the arc already obtained.

Examples.

1. Find the arc whose log tan is 10·577537.

Here the arc is found by inspection to be $75^{\circ} 11'$.

2. Find the arc corresponding to the log sin 9·395401.

Given log = 9·395401

Next less log = 9·395166 = log sin $14^{\circ} 23'$

$$\frac{23500}{820} = 29 \text{ seconds ;}$$

\therefore 9·395401 is the log sin of $14^{\circ} 23' 29''$.

In the sines and tangents of arcs less than about 5° , the differences between any two successive values are so great (as will be seen by an inspection of column D in the table) that the method above given for finding the intermediate values for seconds will not be sufficiently correct; and the same remark applies to the cosines and tangents of arcs greater than about 85° . It will also be observed, that in the cosines and secants of arcs less than 5° , and in the sines and cosecants of arcs greater than 85° , the differences are too small to enable us to calculate accurately the value of any arc from them.

The first of these difficulties may be removed by the rules given below for determining the values of the sines and tangents of small arcs, and the tangents of large arcs, and conversely the arcs from the sines and tangents. A table has also been given (Table IV.) of the logarithmic sines for every tenth of a minute as far as a degree and a half, and of the cosines for every tenth of a minute from $88^{\circ} 29'$ to the end of the quadrant. The second difficulty, however, could only be got over by extending the tables to more decimal places, but as this would also require all other quantities employed in the same calculations to be taken to an equal number of decimals, much additional trouble would be occasioned; and it is therefore better for determining the value of an arc when near 90° ,

employ some other function than its sine, as, for instance, cosine. In order to render this clearer to those who are familiar with the use of logarithms, we subjoin an example such a substitution of the cosine for the sine.

For instance, let it be desired from the formula,

$$P_1 : P_2 :: \sin \beta : \sin \delta$$

determine the value of the angle δ , when $P_1 = 600.1 = 669$; and the angle $\beta = 63^\circ 45'$.

First by multiplying the means and extremes, and dividing the sides by P_1 , we obtain

$$\sin \delta = \frac{P_2 \sin \beta}{P_1} (a.)$$

from Table XXI.

$$\sin \delta = \sqrt{1 - (\cos \delta)^2}$$

$$\therefore \frac{P_2 \sin \beta}{P_1} = \sqrt{1 - (\cos \delta)^2};$$

raising both sides

$$\left(\frac{P_2 \sin \beta}{P_1} \right)^2 = 1 - (\cos \delta)^2,$$

supposing, and extracting the square root

$$\cos \delta = \sqrt{1 - \left(\frac{P_2 \sin \beta}{P_1} \right)^2} . . . (b.)$$

We have, therefore, two equations, (a) and (b), from either of which we can obtain the value of the angle δ , by substituting the values of the known quantities; but in doing so we shall find that the second equation will give the value of δ much more exactly than the first.

Thus, by substituting the known quantities in equation (a), we have

$$\frac{669 \times \sin 63^\circ 45'}{600.1} = \sin \delta.$$

Whence by logarithms,

$$\begin{array}{rcl} \text{Log } \sin 63^\circ 45' & = & 9.952731 \\ \text{Log } 669 & = & 2.825426 \end{array}$$

$$\begin{array}{rcl} & & 12.778157 \\ \text{Log } 600.1 & = & 2.778224 \end{array}$$

$$\text{Log } \sin \delta = 9.999933$$

$$\therefore \delta = 88^\circ 59' 25''.$$

and subtract the sum from 15.314425; the remainder will be the log tan required.

Examples.

1. Find the log tan of $89^{\circ} 5' 13''$.

$$\begin{array}{r} 90^{\circ} \quad 0' \quad 0'' \\ 89 \quad 5 \quad 13 \end{array}$$

$$0^{\circ} 54' 47'' = 3287 \text{ seconds.}$$

$$\text{Constant log} \dots\dots\dots = 15.314425$$

$$\text{Log of } 3287 \dots\dots\dots = 3.516800$$

$$\text{Log cosec of } 89^{\circ} 5' 13'' = .000057 \times \frac{2}{3} = .000038$$

$$3.516838$$

$$\text{Log tan of } 89^{\circ} 5' 13'' = 11.797587$$

2. Find the log tan of $88^{\circ} 51' 10''$.

$$\begin{array}{r} 90^{\circ} \quad 0' \quad 0'' \\ 88 \quad 51 \quad 10 \end{array}$$

$$1^{\circ} 8' 50'' = 4130 \text{ seconds.}$$

$$\text{Constant log} \dots\dots\dots = 15.314425$$

$$\text{Log of } 4130 \dots\dots\dots = 3.615950$$

$$\text{Log cosec of } 88^{\circ} 51' 10'' = .000087 \times \frac{2}{3} = .000058$$

$$3.616008$$

$$\text{Log tan of } 88^{\circ} 51' 10'' = 11.698417$$

To find accurately an arc of not more than 5° from its log sine.

To the given log sin, add 5.314425, and one-third of the decimal portion of the secant of the nearest arc to that whose log sin is given, the sum, rejecting 10 from the characteristic, will be the logarithm of the number of seconds in the arc.

Example.

Required the arc whose log sin is 8.314719.

$$\text{Given log sin} \dots\dots\dots = 8.314719$$

$$\text{Constant log} \dots\dots\dots = 5.314425$$

$$\text{Log sec of nearest arc} = .000093 \div 3 = .000031$$

$$\text{Arc required } 1^{\circ} 10' 58'' = 4258'' = 3.629175$$

To find accurately an arc of not more than 5° from its log tan.

To the given log tan add 5·314425, and from the sum subtract two-thirds of the decimal portion of the log sec of the arc whose log tan is nearest to that given, and the remainder, rejecting 10 from the characteristic, will be the log of the number of seconds in the arc.

Example.

$$\begin{array}{rcl}
 \text{Required the arc whose log tan is } 8\cdot231461 & & \\
 \text{Given log tan } & = & 8\cdot231461 \\
 \text{Constant log } & = & 5\cdot314425 \\
 & & \hline
 & & 13\cdot545886 \\
 \text{Log sec of nearest arc } = \cdot000063 \times \frac{2}{3} = & & \cdot000042 \\
 & & \hline
 \text{Required arc } = 58' 34'' = 3514'' = & & \underline{\underline{13\cdot545844}}
 \end{array}$$

To find accurately an arc greater than 85° from its log tan.

Add to the given log tan two-thirds of the decimal portion of the log cosec of the nearest arc to that whose log tan is given, and subtract the sum from 15·314425; the remainder is the log of the number of seconds that the arc is *less than* 90°.

Example.

$$\begin{array}{rcl}
 \text{Required the arc whose log tan is } 11\cdot695900. & & \\
 \text{Constant log } & = & 15\cdot314425 \\
 \text{Given log tan } & = & 11\cdot695900 \\
 \text{Log cosec of nearest arc } \cdot000088 \times \frac{2}{3} = & & \cdot000059 \\
 & & \hline
 & & 11\cdot695959 \\
 & & \hline
 \text{Required arc } = 1^\circ 9' 14'' = 4154'' = & & \underline{\underline{3\cdot618466}}
 \end{array}$$

In extracting the root or raising the power of any trigonometrical quantity by means of its logarithm, it will always be found most convenient to reduce the assumed radius to unity, by subtracting 10 from the characteristic of the logarithm, which will frequently then become *negative*; it must, however, be borne in mind that the *decimal* part of the logarithm is always *positive*; and therefore, if it is required to multiply a logarithm with a negative characteristic by any number (as the index of a power), first multiply the decimal part of the logarithm, pointing off as many decimal figures in the product

the table the degrees of latitude must be sought at the top of the table, and the minutes in the side column, the meridional parts will then be found at their intersection; thus the meridional parts of $27^{\circ} 25'$ are 1712, and of $76^{\circ} 3'$ are 7222.

The great use of this table for nautical purposes is to determine the latitude and longitude of a ship at sea, when the course and distance that she has run are known. By the *course* of a ship is meant the direction in which she sails, estimated by the angle which that direction makes with the meridian. When the course makes the same angle with every meridian crossed, it is termed a *rhumb*, and this course is that usually adopted by navigators, in consequence of the facilities which it affords in ascertaining the position of their vessels.

On a Mercator's chart any rhumb is obviously a straight line, because no other than a straight line would on such a chart cross every meridian at the same angle. Thus, if A and B, figure 1, are any two places between which a vessel sails, then the straight line A B is the rhumb upon which the vessel would sail to preserve the same course or make the same angle with every meridian crossed; A C is the difference of latitude, C B the difference of longitude, and A B the *nautical distance* run. If now we set off from A towards C, a distance A D equal to the actual difference of latitude measured in degrees at the equator, and draw a line D E parallel to the equator, then will the line A E, measured on the equator, be the true nautical distance, and, being multiplied by 60 (the number of nautical miles in a degree), will give the distance run by the ship, and the line D E is termed the *departure* or distance run either to the east or west.

By inspecting the diagram, we see that $A E : \text{rad} :: A D : \cos \angle A$, or the nautical distance is to radius as the actual difference of latitude is to the cosine of the course; and also $A B : \text{rad} :: B C : \tan \angle A$, or the meridional difference of latitude is to radius as the difference of longitude is to the tangent of the course.

If we put d for the nautical distance, c for the course, l for the difference of the latitude, λ for the meridional difference of latitude, and L for the difference of longitude, we have, from the above proportions,

$$\begin{aligned} \text{rad} . l &= d \cos c, \\ \text{And rad} . L &= \lambda \tan c. \end{aligned}$$

From which formulæ either two of the four quantities d , c , l , and L being known, the others may be easily found.

For example, a vessel leaving latitude $25^{\circ} 34'$ N. and longitude $61^{\circ} 24'$ W. sails 543 nautical miles on a rhumb line, whose course is N. $42^{\circ} 5'$ E., what latitude and longitude is she then in?

$$\begin{array}{rcl} \text{Log } \cos c (= 42^{\circ} 5') & = & 9.870504 \\ \text{Log } d (= 543) & = & 2.734800 \\ \hline & & 12.605304 \\ \text{Rad } & = & 10.000000 \\ \hline & & 2.605304 = \log \text{ of } 403 = l, \\ \hline \hline \end{array}$$

then $403 \div 60 = 6^{\circ} 43' =$ the ship's difference of latitude to the north; therefore, $25^{\circ} 34' + 6^{\circ} 43' = 32^{\circ} 17'$ N. is the latitude she is now in. Again,

$$\begin{array}{rcl} \text{Meridional parts for } 32^{\circ} 17' & = & 2048 \\ \text{,, ,, for } 25 \ 34 & = & 1588 \\ \hline \text{Meridional difference of latitude} & = & \lambda = 560 \\ \text{Log } \tan c (= 42^{\circ} 5') & = & 9.955707 \\ \text{Log } \lambda (= 560) & = & 2.748188 \\ \hline \text{Rad } & = & 10.000000 \\ \hline & & 2.703895 = \log \text{ of } 505.7 = L, \\ \hline \hline \end{array}$$

then $505.7 \div 60 = 8^{\circ} 25' 42'' =$ the ship's difference of longitude to the east; therefore, $61^{\circ} 24' - 8^{\circ} 25' 42'' = 52^{\circ} 58' 28''$ W. is the longitude she is now in.

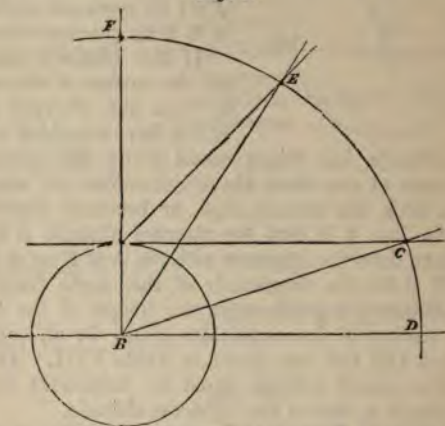
Example 2.—A vessel sails from latitude $41^{\circ} 20'$ N., and longitude $49^{\circ} 50'$ W., to latitude $64^{\circ} 25'$ N., and longitude $10^{\circ} 13' 6''$ W., what was her course and nautical distance?

$$\begin{array}{rcl} \text{Meridional parts for } 64^{\circ} 25' & = & 5097 \\ \text{,, ,, for } 41 \ 20 & = & 2728 \\ \hline & & 23 \ 5 \quad 2369 = \lambda = \left\{ \begin{array}{l} \text{meridional} \\ \text{difference} \\ \text{of latitude.} \end{array} \right. \\ & & 60 \quad \hline \hline \end{array}$$

$$\text{Difference of lat.} = l = 1385$$

body, or the angle which it makes with the *sensible* horizon, and its *true* altitude, or the angle which it forms with the *rational* horizon, is termed its *parallax*. The parallax of a body is greatest when it is in the horizon, and it decreases as its altitude increases, until, when it attains the zenith, its parallax becomes nothing. Thus in fig. 3 the parallax at C is greater than that at E, and is nothing at the zenith F.

Fig. 3.



The amount of the horizontal parallax depends upon the distance of the body A C and upon the earth's radius A B. The nearer the object, that is the less A C is, the greater is the angle A C B or the parallax. The moon being much nearer to the earth than any other of the heavenly bodies, its parallax is much greater, and as its distance from the earth varies so also does its parallax; the amount of its parallax is given in the "Nautical Almanac" for every day throughout the year. The parallax there given is, however, calculated for the earth's greatest or equatorial radius; and since, from the proximity of the moon, the decrease of the earth's radius in higher latitudes diminishes the parallax to such an extent as to require correction, we have given in Table X. the amount to be *subtracted* from the equatorial parallax to give the true parallax in any given latitude. For example, let the earth's equatorial parallax on any given day, as found in the "Nautical Almanac," be 58 minutes, what will it be for the same day in latitude 52° ? Here under 58', and on a line with 52° we find $7''2$, which

ust be subtracted from 58', giving 57' 52'' 8 for the moon's parallax in that latitude.

Table XI.

Augmentation of the Moon's Semidiameter.

In making an observation, it is the position of the *center* of the object which is required, but as it would not be easy in practice to judge with sufficient precision of its position, it is usual to measure to the nearest edge (or *limb*, as it is termed) of the object, and to add the angular value of its semidiameter. In the case of the moon, its apparent semidiameter varies considerably according to its distance from the earth, and also from its great proximity its semidiameter is sensibly increased by the parallax; for, as her altitude increases, she approaches nearer to the observer, and the apparent semidiameter becomes greater. The value of her *horizontal* semidiameter for every day is given in the "Nautical Almanac;" and Table XI. shows the augmentation of the same occasioned by an increased altitude. Thus, when the moon's *horizontal* semidiameter is 5' 30" her *apparent* semidiameter, with an altitude of 51°, will be 15' 42".

Tables XII. and XIII.

Longitude and Time.

As the sun apparently revolves round the earth once in every twenty-four hours, with an equal rate, it arrives at each meridian at a different time. And it is on this principle that the longitude of a place is determined by the interval of time between the sun's passing the meridian of that place and the meridian of Greenwich. As the whole 360° are equal to an interval of 24 hours, any lesser number of degrees are equal to a proportionate interval of time, and these two tables are for facilitating the conversion of longitude into time, or *vice versa*. As an example of their use, let it be required to find the interval of time corresponding with a difference of longitude of 43° 13' 10".

			H.	M.	S.
From 2nd column, Table XII.		40° =	2	40	
" 1st	"	3° =		12	
" 1st	"	10' =		40	
" 1st	"	3' =			12
" 3rd	"	10" =			0.667

The time is therefore . 2 52 52.667

	49° 50' 0"
	10 18 6
	<hr/>
	39 36 54
	60
	<hr/>
Log L (= 2376.9)	= 3.376010
Rad . . .	= 10.000000
	<hr/>
	13.376010
Log λ (= 2369)	= 3.374565
	<hr/>
	10.001445 = log tan 45° 5' 44" = c
	<hr/>
Log l (= 1385)	= 3.141450
Rad . . .	= 10.000000
	<hr/>
	13.141450
Log cos c (= 45° 5' 44")	= 9.848757
	<hr/>
	3.292693 = log of 1962 = d
	<hr/>

Table VII.

Length of a Degree of Longitude on each Parallel of Latitude.

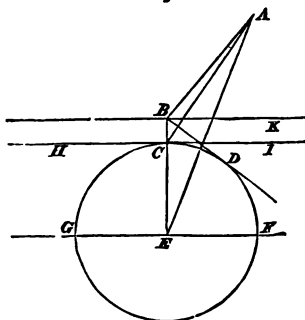
This table requires no explanation; it exhibits the length of a degree of Longitude in nautical miles (each of which equals 6075.6 feet) at every degree of latitude from the Equator to the Poles.

Tables VIII. and IX.

Dip of the Horizon.

The latitude and longitude of a vessel is determined by observations made on the heavenly bodies, which observations consist principally in measuring their altitudes or the angle which they make with the horizon. The altitudes thus taken being compared with certain altitudes given in the "Nautical Almanac," in the manner more fully explained in the "Rudiments of Navigation," enable the observer to determine both his latitude and longitude. It is however requisite to make certain corrections in the observed altitudes in order to obtain the true altitudes.

Fig. 2.



If, in fig. 2, $G C D F$ is a section of the earth, and B the place of an observer, then $G E F$ is the *rational horizon*, and $H C I$ the *sensible horizon*. Also, if A is the place of a heavenly body, the angle $A E F$ is its *true altitude*, $A C I$ its *apparent altitude*, and $A B D$ its *observed altitude*.

If the observer had been on the surface of the earth as C , then the *observed altitude* would have coincided with the

apparent altitude, but when raised above the same, as is always the case at sea when the observations are made from the vessel's deck, the horizon *dips*, or becomes depressed, as shown by the line $B D$, and the *observed altitude* $A B D$ becomes greater than the apparent altitude $A B K$ or $A C I^*$ by the angle $K B D$; the magnitude of this angle (termed the *dip of the horizon*) depends upon the height of the observer above the surface of the earth; its values for all heights between 1 and 140 feet are given in Table VIII. The angle found in the second column must be *subtracted* from the *observed altitude* to obtain the *apparent altitude*.

The dip given in Table VIII. supposes that the view of the sea horizon is perfectly unobstructed. Should, however, any object intervene, as a coast, the margin of the sea where it meets the shore must then be taken as the horizon; and in this case the angle to be *subtracted* from the *observed altitude* will be found in Table IX. under the proper height, and on a line with the distance of the object from the observer, which may always be judged of with sufficient precision by an experienced eye. Thus, if the vessel is about 2 miles from the shore and the observer is 20 feet above the surface of the sea, the angle to be subtracted for the dip will be 6 minutes.

Table X.

Reduction of the Moon's Horizontal Parallax.

The difference between the *apparent altitude* of a heavenly

* The distance $B C$ of the observer above the earth's surface is so inconsiderable, as compared with $B A$, the distance of the body, that these two angles may be considered as equal without any appreciable error.

Under 56', and opposite 29° 30', we find	47'	1"
Add proportional parts for parallax 20"		18
" " " " 4"		3.5
		<hr/>
		17 22.5
Subtract prop. parts for altitude 7'	7'	3
		<hr/>
Correction required		17 19.5
		<hr/>

The moon's true altitude therefore equals 29° 54' 19".5.

Ex. 2. What is the moon's true altitude when its apparent altitude is 9° 53', and its horizontal parallax is 58° 20'?

Under 58' and opposite 9° 50' we find .	51'	44"
Add proportional parts for parallax 20"		20
" " " for altitude 3'		2
		<hr/>
Correction		52 6
		<hr/>

Therefore the moon's true altitude equals 10° 45' 6".

Table XVIII.

Logarithms for finding the Horary Angle or Apparent Time.

The use of this Table is to facilitate the calculation of the Apparent Time at any place, from observations made on the altitude of some known celestial body. The logarithms in the Table are twice the sine of half the arc of longitude corresponding with the number of hours and minutes at which it stands. The manner of performing the calculation by which this logarithm is derived from the observed altitude is fully explained in the "Rudimentary Work on Navigation." The use of the Table is as follows:—having obtained this logarithm, look in the table for it, or for the next less logarithm to it, and take out the time in hours and minutes as found (if the altitude is *decreasing*) at the top and in the left-hand column (but if *increasing*) at the bottom, and in the right-hand column. Then subtract the logarithm taken in the table from the given logarithm, and having added to the right of the difference thus obtained two cyphers, divide it by the nearest number in the contiguous column headed *Diff.*, and the quotient will be the number of seconds to be *added*

to the hours and minutes already obtained, when the altitude is *decreasing*, and to be *subtracted* when *increasing*. For example, what is the apparent time corresponding to the logarithm 9.649321 when the altitude was decreasing?

Given log 9.649321

Next less log in Table 9.648913 = log of 5 H. 35 M.

$$40800 \div 3516 = 11 \text{ seconds}$$

Therefore, the apparent time required is 5 H. 35 M. 11 s

Ex. 2. What is the apparent time corresponding with the logarithm 9.215630, when the altitude was increasing?

Given log 9.215630

Next less log in Table 9.214358 = 20 H. 49 M.

$$127200 \div 7114 = 18 \text{ seconds.}$$

Therefore, the apparent time is 20 H. 48 M. 42 s

Table XIX.

Common and Hyperbolic Logarithms.

The object of this Table is to facilitate the conversion of common logarithms into hyperbolic, and *vice versa*. Its use is as follows:—To convert common logarithms into hyperbolic, write the common logarithm, as shown in the first example below, and then take from the second column of the Table the equivalent value of each figure in hyperbolic logarithms, taking care that the latter are each moved as many places to the right as the corresponding numbers in the common logarithm are; the sum of the whole will be the hyperbolic logarithm required.

To convert hyperbolic logarithms into common, proceed in a similar manner, writing the hyperbolic logarithm as in the second example below, and taking its equivalent value in common logarithms from the fourth column of the Table.

Ex. 1. What is the hyperbolic logarithm of 3156?

By reference to Table I. we find the common logarithm of 3156 is 3.499137; then—

Com. Log.	Hyp. Log.	
3	= 6.907755	3
.4	= .921084	0
.09	= .207232	7
.009	= .020723	3
.0001	= .000230	3
.00003	= .000069	1
.000007	= .000016	1

8.057061

Ex. 2. What is the common logarithm of the number whose hyperbolic logarithm is 5.160731?

Hyp. Log.	Com. Log.	
5	= 2.171472	4
.1	= .043429	5
.06	= .026057	7
.0007	= .000304	0
.00003	= .000013	0
.000001	= .000000	4

2.241277

Table XX.

Curvature of the Earth and Refraction.

This Table is of use in Geodesical operations. Practically, a level line on the earth's surface is a line everywhere equally distant from its center. It is obviously, therefore, not a straight line, but is a portion of a circle, having the same radius as the earth. When a level, theodolite, or other instrument has the axis of its telescope so adjusted as to be truly level, the prolongation of that axis is not a level line, but is a tangent to that line, coinciding with it only at the point where the instrument stands, and being *above* it everywhere else. The height of this line above the true level line, if there were no refraction, would be equal to the versine of an arc whose radius equalled that of the earth, and whose length was equal to the distance from the instrument: these heights for various distances up to 30 miles are given in the second column of the Table. The effect, however, of the refraction of the atmosphere is to curve the visual ray passing through the center or axis of the telescope, so that the optical axis is

really a curved line which approximates very nearly to a circle, having a radius seven times greater than that of the earth. The heights in the second column require to be reduced by a seventh part, and the numbers thus obtained are given in the third column. To exemplify its use, let us suppose that an instrument, placed in an elevated position, has its telescope directed to a church tower 3 miles distant, and that when its telescope is perfectly level the horizontal wires are found to cut a point in one of the windows, which, on direct measurement, is found to be 95 feet from the ground, it is required to ascertain the real difference of level of the two spots. Now, on reference to the Table, we find the correction for 3 miles is 5.14, which, being *subtracted* from 95 feet, gives 89.86 feet for the actual height of the instrument above the ground on which the tower stands. In taking a series of consecutive observations, as in the ordinary operation of levelling by *back* and *fore* sights, to ascertain the relative level of two distant places, so long as no great difference in the range or length of the sights occurs, no correction for curvature or refraction need be made, for when the sights are actually equal no error arises in the ultimate result.

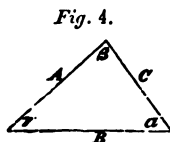
Tables XXI., XXII., XXIII., and XXIV.

Trigonometrical Expressions.

These Tables require no particular explanation. Table XXI. contains equivalent expressions for $\sin a$, $\cos a$, $\tan a$, $\cot a$, $\sec a$, $\csc a$, $\text{versin } a$, and will be found of considerable use in reducing formulæ containing trigonometrical expressions. Table XXII contains expressions, the \sin , \cos , \tan , and \cot , of multiple arcs. Table XXIII. contains a variety of formulæ relating to the trigonometrical functions of two angles or arcs. And Table XXIV. contains expressions for the \sin , \cos , \tan , and \cot , in terms of the arc, and for the arc in terms of the \sin and \tan , and also expressions for the powers of the \sin and \cos .

Table XXV.

The formulæ given in this Table are intended to enable all the six parts of a plane rectilineal triangle to be determined when any three of those parts were previously known. When either a side or angle is wanted it will only be necessary to make



A or β the side or angle as the case may be, and to in the formulæ the proper values of those letters which known, which will then express the value wanted. For ample, in a triangle, two of whose sides are 23 and 35 feet length, and the angle included between is 51° , what is length of the third side? In this case we have given B and α , and want to find A, we must, therefore, select a formula containing only those letters; we find, accordingly, No. 7 gi

$$A = \sqrt{(B^2 + C^2 - 2 B \cdot C \cdot \cos \alpha.)}$$

We have $B = 23$, $C = 35$, $\cos 51^\circ = .62932$; inserting the values, we have

$$A = \sqrt{(23^2 + 35^2 - 2 \times 23 \times 35 \times .62932)} = 27.217,$$

which is the length of the side required.

Table XXVI.

The formulæ given in this Table are to facilitate the solution of quadratic and cubic equations, in order to which it only necessary to substitute for p and q their known values the formulæ when the value of x will be determined.] way of example, let it be required to find the value of x in the cubic equation $x^3 + 3x - 536 = 0$. We see by reference the Table that this corresponds with equation (6) in the Table, p being equal to 3, and q to 536. Then, if we substitute these values in the second expression, it becomes—

$$\tan a = \frac{3}{3 \times 536} 2 \sqrt{\frac{3}{3}} = \frac{2}{536}$$

$$\text{therefore, } a = 0^\circ 12' 36'', \text{ and } \frac{1}{2}a = 0^\circ 6' 18'';$$

Then,

$$\tan \beta = \sqrt[3]{\tan (6' 18'')};$$

$$\text{therefore, } \beta = 7^\circ 1' 5'', \text{ and } 2 \beta = 14^\circ 2' 10'',$$

and,

$$x = 2 \sqrt{\frac{3}{3}} \cdot \cot (14^\circ 2' 10'') = 8,$$

which is the true value of x .

Table XXVII.

This Table contains the differential coefficients of some of the most frequently-occurring functions of u , and will be found to include all the rules for simple differentiation.

Table XXVIII.

This Table contains a variety of constant numbers of frequent use in general calculations; it also contains their logarithms to seven places of decimals, and the arithmetical complements of the same. The latter will be found of use in cases where it is required to divide by the numbers in the Table.

Table XXIX.

To reduce the Sun's Declination to any given Meridian, and to any time under that Meridian.

In the "Nautical Almanac" the sun's declination is given for each day at noon at Greenwich; it is, however, necessary for the purposes of navigation to ascertain its declination at any other meridian, either at noon or at any other time of the day. In either of these cases, having obtained the declination from page II. of the month, in the "Nautical Almanac," the correction to be either added or subtracted therefrom, according to the directions given below, may be found in the following manner.

I. *If the sun's declination is required for some other meridian at noon*, reckon the difference of longitude between that meridian and Greenwich, then look for this difference in the first left-hand column of the table, and on the line on which the same is found, and in the vertical column having at its head the nearest number to the declination already taken from the "Nautical Almanac," will be found the correction required. It will be seen in the "Nautical Almanac," whether the sun's declination is increasing or decreasing; when decreasing, add the correction in east longitude, and subtract it in west longitude; but when the declination is increasing, subtract the correction in east longitude, and add it in west longitude.

Example.

What was the sun's declination at noon, on the 13th of November, 1850, in longitude 175° w.?

Here we find, from the "Nautical Almanac," that the sun's declination at noon at Greenwich was $17^{\circ} 58' 1''$ south, and that it was increasing. We next look in the first col-

of the table for the given difference of longitude, viz., 175° , but the nearest number that we find is 170° , which is 5° too small, and we must therefore add together the corrections found in the proper vertical column on both the lines having 5° and 170° in the first column. Thus, in the present instance, in the column having at its head 18° (the nearest to $17^{\circ} 58' 1''$) and on the same line with 5° we find $13''$, and on the same line with 170° we find $7' 22''$; these being added together give $7' 35''$ for the required correction, which, as the sun's declination is increasing and the difference of longitude is westerly, has to be added to $17^{\circ} 58' 1''$, making $18^{\circ} 5' 36'$ for the sun's declination at noon in longitude 175° west.

II. *If the sun's declination is required for Greenwich at any other hour than noon*, reckon the interval between that time and noon; then look for this interval in the last right-hand column of the table, and on the same line in which it is found, and in the vertical column having at its head the nearest number to the sun's declination (from the "Nautical Almanac"), will be found the required correction, which, when the sun's declination is increasing, is to be added, if the time is after noon, and subtracted if before noon; but when the declination is decreasing must be subtracted if the time is after noon, and added if before noon.

Examples.

What was the sun's declination at Greenwich on the 4th of July, 1850, at 7 h. 28 m.?

From the "Nautical Almanac" we find the sun's declination at noon to have been $22^{\circ} 54' 58''$ north, and to have been decreasing. Then looking in the last column of the table for the nearest number to 7 h. 28 m., we find 7 h. 20 m., and on the same line in the column headed with 23° (the nearest number to $22^{\circ} 54' 58''$) we find $1' 30''$, and in the same vertical column on the same line with 8 m. we find $2''$, therefore the correction is $1' 32''$, which, as the sun's declination was decreasing, and the time after noon, has to be subtracted from $22^{\circ} 54' 58''$, leaving $22^{\circ} 53' 26''$ north for the sun's declination at the hour required.

What was the sun's declination at Greenwich on the 24th of August, 1850, at 20 h. 12 m.?

In this instance the time given, viz., 20 h. 12 m. on the 24th is equivalent to 3 h. 48 m. before noon on the 25th, for which day the sun's declination is found in the "Nautical Almanac" to have been $10^{\circ} 48' 56''$ north, and to have been

decreasing. Looking then in the column of the table having at its head 11° (the nearest to $10^{\circ} 48' 56''$) and on the same line with 3 h. 20 m. we find $2' 56''$, and on the same line with 28 m. we find $25''$; adding these two together, we obtain $3' 21''$ for the correction, which, as the sun's declination is decreasing, and the time before noon, must be *added* to $10^{\circ} 48' 56''$, making $10^{\circ} 52' 17''$ north for the sun's declination at the time required.

III. If the sun's declination is required for some other meridian than Greenwich, at any other hour than noon, we must first make the necessary correction for the difference of longitude in the manner already explained, and then the correction for time according to rule II.

Examples.

What was the sun's declination on the 17th of May, 1850, at 5 h. 40 m., in longitude 128° E.?

[illegible]

What was the sun's declination on the 3rd of June, 1850, at 17 h. 20 m., in longitude 79° w.?

17 h. 20 m. on the 3rd, is equivalent to 6 h. 40 m. on the 4th

Sun's declination (increasing) at Greenwich,	22° 25' 47" N
at noon	
Add correction for 70°.	1' 41"
Add correction for 9°.	0 12
	<hr/>
	22 27 40
Subtract correction for 6 h. 40 m.	0 2 24
	<hr/>
Sun's declination at the time and place required	22 25 16 N.

No. 110 L 041.] LOGARITHMS OF NUMBERS. [No. 119

N.	0	1	2	3	4	5	6	7	8	9
110	041393	1787	2182	2576	2969	3362	3755	4148	4540	4932
1	5323	5714	6105	6495	6885	7275	7664	8053	8442	8831
2	9218	9606	9993	0380	0766	1153	1538	1924	2309	2694
3	053078	3463	3846	4230	4613	4996	5378	5760	6142	6523
4	6905	7286	7666	8046	8426	8805	9185	9563	9942	0321
5	060698	1075	1452	1829	2206	2582	2958	3333	3709	4084
6	4458	4832	5206	5580	5953	6326	6699	7071	7443	7815
7	8186	8557	8928	9298	9668	0038	0407	0776	1145	1514
8	071882	2250	2617	2985	3352	3718	4085	4451	4816	5182
9	5547	5912	6276	6640	7004	7368	7731	8094	8457	8820

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8
1101	39'4	78'8	118'2	157'6	197'0	236'4	275'8	315'2
1104	39'3	78'6	117'9	157'2	196'5	235'8	275'1	314'4
1106	39'2	78'4	117'6	156'8	196'0	235'2	274'4	313'6
1109	39'1	78'2	117'3	156'4	195'5	234'6	273'7	312'8
1112	39'0	78'0	117'0	156'0	195'0	234'0	273'0	312'0
1115	38'9	77'8	116'7	155'6	194'5	233'4	272'3	311'2
1118	38'8	77'6	116'4	155'2	194'0	232'8	271'6	310'4
1121	38'7	77'4	116'1	154'8	193'5	232'2	270'9	309'6
1124	38'6	77'2	115'8	154'4	193'0	231'6	270'2	308'8
1127	38'5	77'0	115'5	154'0	192'5	231'0	269'5	308'0
1129	38'4	76'8	115'2	153'6	192'0	230'4	268'8	307'2
1132	38'3	76'6	114'9	153'2	191'5	229'8	268'1	306'4
1135	38'2	76'4	114'6	152'8	191'0	229'2	267'4	305'6
1138	38'1	76'2	114'3	152'4	190'5	228'6	266'7	304'8
1141	38'0	76'0	114'0	152'0	190'0	228'0	266'0	304'0
1144	37'9	75'8	113'7	151'6	189'5	227'4	265'3	303'2
1148	37'8	75'6	113'4	151'2	189'0	226'8	264'6	302'4
1151	37'7	75'4	113'1	150'8	188'5	226'2	263'9	301'6
1154	37'6	75'2	112'8	150'4	188'0	225'6	263'2	300'8
1157	37'5	75'0	112'5	150'0	187'5	225'0	262'5	300'0
1160	37'4	74'8	112'2	149'6	187'0	224'4	261'8	299'2
1163	37'3	74'6	111'9	149'2	186'5	223'8	261'1	298'4
1166	37'2	74'4	111'6	148'8	186'0	223'2	260'4	297'6
1169	37'1	74'2	111'3	148'4	185'5	222'6	259'7	296'8
1172	37'0	74'0	111'0	148'0	185'0	222'0	259'0	296'0
1175	36'9	73'8	110'7	147'6	184'5	221'4	258'3	295'2
1178	36'8	73'6	110'4	147'2	184'0	220'8	257'6	294'4
1182	36'7	73'4	110'1	146'8	183'5	220'2	256'9	293'6
1185	36'6	73'2	109'8	146'4	183'0	219'6	256'2	292'8
1188	36'5	73'0	109'5	146'0	182'5	219'0	255'7	292'0
1192	36'4	72'8	109'2	145'6	182'0	218'4	254'8	291'2
1195	36'3	72'6	108'9	145'2	181'5	217'8	254'1	290'4
1198	36'2	72'4	108'6	144'8	181'0	217'2	253'4	289'6
1202	36'1	72'2	108'3	144'4	180'5	216'6	252'7	288'8
1205	36'0	72'0	108'0	144'0	180'0	216'0	252'0	288'0
1208	35'9	71'8	107'7	143'6	179'5	215'4	251'3	287'2
1212	35'8	71'6	107'4	143'2	179'0	214'8	250'6	286'4
1215	35'7	71'4	107'1	142'8	178'5	214'2	249'9	285'6
1218	35'6	71'2	106'8	142'4	178'0	213'6	249'2	284'8

No. 120 L. 079.]

LOGARITHMS OF NUMBERS.

[No. 134 L. 130.]

N.	0	1	2	3	4	5	6	7	8	9	N.
120	079181	9543	9904	0266	0626	0987	1347	1707	2067	2426	120
1	082785	3144	3503	3861	4219	4576	4934	5291	5647	6004	1
2	6360	6716	7071	7426	7781	8136	8490	8845	9198	9552	2
3	9905	0258	0611	0963	1315	1667	2018	2370	2721	3071	3
4	093422	3772	4122	4471	4820	5169	5518	5866	6215	6562	4
5	6910	7257	7604	7951	8298	8644	8990	9335	9681	0026	5
6	100371	0715	1059	1403	1747	2091	2434	2777	3119	3462	6
7	3804	4146	4487	4828	5169	5510	5851	6191	6531	6871	7
8	7210	7549	7888	8227	8565	8903	9241	9579	9916	0253	8
9	110590	0926	1263	1599	1934	2270	2605	2940	3275	3609	9
130	3943	4277	4611	4944	5278	5611	5943	6276	6608	6940	130
1	7271	7603	7934	8265	8595	8926	9256	9586	9915	0245	1
2	120574	0903	1231	1560	1888	2216	2544	2871	3198	3525	2
3	3852	4178	4504	4830	5156	5481	5806	6131	6456	6781	3
4	7105	7429	7753	8076	8399	8722	9045	9368	9690	0012	4

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8	9
1222	35'5	71'0	106'5	142'0	177'5	213'0	248'5	284'0	319'5
1225	35'4	70'8	106'2	141'6	177'0	212'4	247'8	283'2	318'6
1228	35'3	70'6	105'9	141'2	176'5	211'8	247'1	282'4	317'7
1231	35'2	70'4	105'6	140'8	176'0	211'4	246'4	281'6	316'8
1235	35'1	70'2	105'3	140'4	175'5	210'6	245'7	280'8	315'9
1239	35'0	70'0	105'0	140'0	175'0	210'0	245'0	280'0	315'0
1243	34'9	69'8	104'7	139'6	174'5	209'4	244'3	279'2	314'1
1247	34'8	69'6	104'4	139'2	174'0	208'8	243'6	278'4	313'2
1250	34'7	69'4	104'1	138'8	173'5	208'2	242'9	277'6	312'3
1253	34'6	69'2	103'8	138'4	173'0	207'6	242'2	276'8	311'4
1257	34'5	69'0	103'5	138'0	172'5	207'0	241'5	276'0	310'5
1261	34'4	68'8	103'2	137'6	172'0	206'4	240'8	275'2	309'6
1264	34'3	68'6	102'9	137'2	171'5	205'8	240'1	274'4	308'7
1268	34'2	68'4	102'6	136'8	171'0	205'2	239'4	273'6	307'8
1272	34'1	68'2	102'3	136'4	170'5	204'6	238'7	272'8	306'9
1276	34'0	68'0	102'0	136'0	170'0	204'0	238'0	272'0	306'0
1279	33'9	67'8	101'7	135'6	169'5	203'4	237'3	271'2	305'1
1283	33'8	67'6	101'4	135'2	169'0	202'8	236'6	270'4	304'2
1287	33'7	67'4	101'1	134'8	168'5	202'2	235'9	269'6	303'3
1291	33'6	67'2	100'8	134'4	168'0	201'6	235'2	268'8	302'4
1295	33'5	67'0	100'5	134'0	167'5	201'0	234'5	268'0	301'5
1298	33'4	66'8	100'2	133'6	167'0	200'4	233'8	267'2	300'6
1302	33'3	66'6	99'9	133'2	166'5	199'8	233'1	266'4	299'7
1306	33'2	66'4	99'6	132'8	166'0	199'2	232'4	265'6	298'8
1310	33'1	66'2	99'3	132'4	165'5	198'6	231'7	264'8	297'9
1314	33'0	66'0	99'0	132'0	165'0	198'0	231'0	264'0	297'0
1318	32'9	65'8	98'7	131'6	164'5	197'4	230'3	263'2	296'1
1322	32'8	65'6	98'4	131'2	164'0	196'8	229'6	262'4	295'2
1326	32'7	65'4	98'1	130'8	163'5	196'2	228'9	261'6	294'3
1330	32'6	65'2	97'8	130'4	163'0	195'6	228'2	260'8	293'4
1334	32'5	65'0	97'5	130'0	162'5	195'0	227'5	260'0	292'5
1338	32'4	64'8	97'2	129'6	162'0	194'4	226'8	259'2	291'6
1343	32'3	64'6	96'9	129'2	161'5	193'8	226'1	258'4	290'7
1347	32'2	64'4	96'6	128'8	161'0	193'2	225'4	257'6	289'8

No. 170 L. 230.]

LOGARITHMS OF NUMBERS.

[No. 189]

N.	0	1	2	3	4	5	6	7	8	9
170	230449	0704	0960	1215	1470	1724	1979	2234	2488	27
1	2996	3250	3504	3757	4011	4264	4517	4770	5023	52
2	5528	5781	6033	6285	6537	6789	7041	7292	7544	77
3	8046	8297	8548	8799	9049	9299	9550	9800	0050	03
4	240549	0799	1048	1297	1546	1795	2044	2293	2541	27
5	3038	3286	3534	3782	4030	4277	4525	4772	5019	52
6	5513	5759	6006	6252	6499	6745	6991	7237	7482	77
7	7973	8219	8464	8709	8954	9198	9443	9687	9932	01
8	250420	0664	0908	1151	1395	1638	1881	2125	2368	26
9	2853	3096	3338	3580	3822	4064	4306	4548	4790	50
180	5273	5514	5755	5996	6237	6477	6718	6958	7198	74
1	7679	7918	8158	8398	8637	8877	9116	9355	9594	98
2	260071	0310	0548	0787	1025	1263	1501	1739	1976	22
3	2451	2688	2925	3162	3399	3636	3873	4109	4346	46
4	4818	5054	5290	5525	5761	5996	6232	6467	6702	69
5	7172	7406	7641	7875	8110	8344	8578	8812	9046	93
6	9513	9746	9980	0213	0446	0679	0912	1144	1377	16
7	271842	2074	2306	2538	2770	3001	3233	3464	3696	39
8	4158	4389	4620	4850	5081	5311	5542	5772	6002	62
9	6462	6692	6921	7151	7380	7609	7838	8067	8296	85

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8
1706	25'4	50'8	76'2	101'6	127'0	152'4	177'8	203'2
1713	25'3	50'6	75'9	101'2	126'5	151'8	177'1	202'5
1719	25'2	50'4	75'6	100'8	126'0	151'2	176'4	202'1
1726	25'1	50'2	75'3	100'4	125'5	150'6	175'7	200'0
1733	25'0	50'0	75'0	100'0	125'0	150'0	175'0	200'0
1740	24'9	49'8	74'7	99'6	124'5	149'4	174'3	199'9
1747	24'8	49'6	74'4	99'2	124'0	148'8	173'6	198'8
1754	24'7	49'4	74'1	98'8	123'5	148'2	172'9	197'7
1761	24'6	49'2	73'8	98'4	123'0	147'6	172'2	196'6
1769	24'5	49'0	73'5	98'0	122'5	147'0	171'5	196'0
1776	24'4	48'8	73'2	97'6	122'0	146'4	170'8	195'5
1783	24'3	48'6	72'9	97'2	121'5	145'8	170'1	194'9
1790	24'2	48'4	72'6	96'8	121'0	145'2	169'4	193'3
1798	24'1	48'2	72'3	96'4	120'5	144'6	168'7	192'7
1805	24'0	48'0	72'0	96'0	120'0	144'0	168'0	192'0
1813	23'9	47'8	71'7	95'6	119'5	143'4	167'3	191'1
1820	23'8	47'6	71'4	95'2	119'0	142'8	166'6	190'5
1828	23'7	47'4	71'1	94'8	118'5	142'2	165'9	189'9
1836	23'6	47'2	70'8	94'4	118'0	141'6	165'2	188'3
1844	23'5	47'0	70'5	94'0	117'5	141'0	164'5	188'0
1852	23'4	46'8	70'2	93'6	117'0	140'4	163'8	187'5
1859	23'3	46'6	69'9	93'2	116'5	139'8	163'1	186'9
1867	23'2	46'4	69'6	92'8	116'0	139'2	162'4	186'3
1876	23'1	46'2	69'3	92'4	115'5	138'6	161'7	185'7
1884	23'0	46'0	69'0	92'0	115'0	138'0	161'0	185'0
1892	22'9	45'8	68'7	91'6	114'5	137'4	160'3	184'4
1900	22'8	45'6	68'4	91'2	114'0	136'8	159'6	183'8
1908	22'7	45'4	68'1	90'8	113'5	136'2	158'9	183'2
1917	22'6	45'2	67'8	90'4	113'0	135'6	158'2	182'6

No. 190 L. 278.]		LOGARITHMS OF NUMBERS.									[No. 214 L. 332.]	
N.	0	1	2	3	4	5	6	7	8	9	N.	
10	278754	8982	9211	9439	9667	9895	0123	0351	0578	0806	190	
1	281033	1261	1488	1715	1942	2169	2396	2622	2849	3075	1	
2	3301	3527	3753	3979	4205	4431	4656	4882	5107	5332	2	
3	5557	5782	6007	6232	6456	6681	6905	7130	7354	7578	3	
4	7802	8026	8249	8473	8696	8920	9143	9366	9589	9812	4	
5	290035	0257	0480	0702	0925	1147	1369	1591	1813	2034	5	
6	2256	2478	2699	2920	3141	3363	3584	3804	4025	4246	6	
7	4466	4687	4907	5127	5347	5567	5787	6007	6226	6446	7	
8	6665	6884	7104	7323	7542	7761	7979	8198	8416	8635	8	
9	8853	9071	9289	9507	9725	9943	0161	0378	0595	0813	9	
10	301030	1247	1464	1681	1898	2114	2331	2547	2764	2980	200	
1	3196	3412	3628	3844	4059	4275	4491	4706	4921	5136	1	
2	5351	5566	5781	5996	6211	6425	6639	6854	7068	7282	2	
3	7496	7710	7924	8137	8351	8564	8778	8991	9204	9417	3	
4	9630	9843	0056	0268	0481	0693	0906	1118	1330	1542	4	
5	311754	1966	2177	2389	2600	2812	3023	3234	3445	3656	5	
6	3867	4078	4289	4499	4710	4920	5130	5340	5551	5760	6	
7	5970	6180	6390	6599	6809	7018	7227	7436	7646	7854	7	
8	8063	8272	8481	8689	8898	9106	9314	9522	9730	9938	8	
9	320146	0354	0562	0769	0977	1184	1391	1598	1805	2012	9	
10	2219	2426	2633	2839	3046	3252	3458	3665	3871	4077	210	
1	4282	4488	4694	4899	5105	5310	5516	5721	5926	6131	1	
2	6336	6541	6745	6950	7155	7359	7563	7767	7972	8176	2	
3	8380	8583	8787	8991	9194	9398	9601	9805	0008	0211	3	
4	330414	0617	0819	1022	1225	1427	1630	1832	2034	2236	4	

N.	1	2	3	4	5	6	7	8	9
1925	22'5	45'0	67'5	90'0	112'5	135'0	157'5	180'0	202'5
1934	22'4	44'8	67'2	89'6	112'0	134'4	156'8	179'2	201'6
1943	22'3	44'6	66'9	89'2	111'5	133'8	156'1	178'4	200'7
1952	22'2	44'4	66'6	88'8	111'0	133'2	155'4	177'6	199'8
1961	22'1	44'2	66'3	88'4	110'5	132'6	154'7	176'8	198'9
1969	22'0	44'0	66'0	88'0	110'0	132'0	154'0	176'0	198'0
1978	21'9	43'8	65'7	87'6	109'5	131'4	153'3	175'2	197'1
1987	21'8	43'6	65'4	87'2	109'0	130'8	152'6	174'4	196'2
1996	21'7	43'4	65'1	86'8	108'5	130'2	151'9	173'6	195'3
2005	21'6	43'2	64'8	86'4	108'0	129'6	151'2	172'8	194'4
2015	21'5	43'0	64'5	86'0	107'5	129'0	150'5	172'0	193'5
2024	21'4	42'8	64'2	85'6	107'0	128'4	149'8	171'2	192'6
2034	21'3	42'6	63'9	85'2	106'5	127'8	149'1	170'4	191'7
2043	21'2	42'4	63'6	84'8	106'0	127'2	148'4	169'6	190'8
2053	21'1	42'2	63'3	84'4	105'5	126'6	147'7	168'8	189'9
2063	21'0	42'0	63'0	84'0	105'0	126'0	147'0	168'0	189'0
2073	20'9	41'8	62'7	83'6	104'5	125'4	146'3	167'2	188'1
2082	20'8	41'6	62'4	83'2	104'0	124'8	145'6	166'4	187'2
2092	20'7	41'4	62'1	82'8	103'5	124'2	144'9	165'6	186'3
2103	20'6	41'2	61'8	82'4	103'0	123'6	144'2	164'8	185'4
2113	20'5	40'0	61'5	82'0	102'5	123'0	143'5	164'0	184'5
2123	20'4	40'8	61'2	81'6	102'0	122'4	142'8	163'2	183'6
2134	20'3	40'6	60'9	81'2	101'5	121'8	142'1	162'4	182'7
2144	20'2	40'4	60'6	80'8	101'0	121'2	141'4	161'6	181'8

No. 215 L. 332.]

LOGARITHMS OF NUMBERS.

[No.

N.	0	1	2	3	4	5	6	7	8
215	332438	2640	2842	3044	3246	3447	3649	3850	4051
6	4454	4655	4856	5057	5257	5458	5658	5859	6059
7	6460	6660	6860	7060	7260	7459	7659	7858	8058
8	8456	8656	8855	9054	9253	9451	9650	9849	0047
9	340444	0642	0841	1039	1237	1435	1632	1830	2028
220	2423	2620	2817	3014	3212	3409	3606	3802	3999
1	4392	4589	4785	4981	5178	5374	5570	5766	5962
2	6353	6549	6744	6939	7135	7330	7525	7720	7915
3	8305	8500	8694	8889	9083	9278	9472	9666	9860
4	350248	0442	0636	0829	1023	1216	1410	1603	1796
5	2183	2375	2568	2761	2954	3147	3339	3532	3724
6	4108	4301	4493	4685	4876	5068	5260	5452	5643
7	6026	6217	6408	6599	6790	6981	7172	7363	7554
8	7935	8125	8316	8506	8696	8886	9076	9266	9456
9	9835	0025	0215	0404	0593	0783	0972	1161	1350
230	361728	1917	2105	2294	2482	2671	2859	3048	3236
1	3612	3800	3988	4176	4363	4551	4739	4926	5113
2	5488	5675	5862	6049	6236	6423	6610	6796	6983
3	7356	7542	7729	7915	8101	8287	8473	8659	8845
4	9216	9401	9587	9772	9958	0143	0328	0513	0698
5	371068	1253	1437	1622	1806	1991	2175	2360	2544
6	2912	3096	3280	3464	3647	3831	4015	4198	4382
7	4748	4932	5115	5298	5481	5664	5846	6029	6212
8	6577	6759	6942	7124	7306	7488	7670	7852	8034
9	8398	8580	8761	8943	9124	9306	9487	9668	9849

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7
2155	20.1	40.2	60.3	80.4	100.5	120.6	140.7
2166	20.0	40.0	60.0	80.0	100.0	120.0	140.0
2176	19.9	39.8	59.7	79.6	99.5	119.4	139.3
2187	19.8	39.6	59.4	79.2	99.0	118.8	138.6
2198	19.7	39.4	59.1	78.8	98.5	118.2	137.9
2210	19.6	39.2	58.8	78.4	98.0	117.6	137.2
2221	19.5	39.0	58.5	78.0	97.5	117.0	136.5
2232	19.4	38.8	58.2	77.6	97.0	116.4	135.8
2244	19.3	38.6	57.9	77.2	96.5	115.8	135.1
2256	19.2	38.4	57.6	76.8	96.0	115.2	134.4
2267	19.1	38.2	57.3	76.4	95.5	114.6	133.7
2279	19.0	38.0	57.0	76.0	95.0	114.0	133.0
2291	18.9	37.8	56.7	75.6	94.5	113.4	132.3
2303	18.8	37.6	56.4	75.2	94.0	112.8	131.6
2316	18.7	37.4	56.1	74.8	93.5	112.2	130.9
2328	18.6	37.2	55.8	74.4	93.0	111.6	130.2
2341	18.5	37.0	55.5	74.0	92.5	111.0	129.5
2353	18.4	36.8	55.2	73.6	92.0	110.4	128.8
2366	18.3	36.6	54.9	73.2	91.5	109.8	128.1
2379	18.2	36.4	54.6	72.8	91.0	109.2	127.4
2392	18.1	36.2	54.3	72.4	90.5	108.6	126.7
2406	18.0	36.0	54.0	72.0	90.0	108.0	126.0
2419	17.9	35.8	53.7	71.6	89.5	107.4	125.3

[No. 240 L. 380.]

LOGARITHMS OF NUMBERS.

[No. 269 L. 431.]

N.	0	1	2	3	4	5	6	7	8	9	N.
240	38021	0392	0573	0754	0934	1115	1296	1476	1656	1837	240
1	2017	2197	2377	2557	2737	2917	3097	3277	3456	3636	1
2	3815	3995	4174	4353	4533	4712	4891	5070	5249	5428	2
3	5606	5785	5964	6142	6321	6499	6677	6856	7034	7212	3
4	7390	7568	7746	7924	8101	8279	8456	8634	8811	8989	4
5	9166	9343	9520	9698	9875	0051	0228	0405	0582	0759	5
6	390935	1112	1288	1464	1641	1817	1993	2169	2345	2521	6
7	2697	2873	3048	3224	3400	3575	3751	3926	4101	4277	7
8	4452	4627	4802	4977	5152	5326	5501	5676	5850	6025	8
9	6199	6374	6548	6722	6896	7071	7245	7419	7592	7766	9
250	7940	8114	8287	8461	8634	8808	8981	9154	9328	9501	250
1	9674	9847	0020	0192	0365	0538	0711	0883	1056	1228	1
2	401401	1573	1745	1917	2089	2261	2433	2605	2777	2949	2
3	3121	3292	3464	3635	3807	3978	4149	4320	4492	4663	3
4	4834	5005	5176	5346	5517	5688	5858	6029	6199	6370	4
5	6540	6710	6881	7051	7221	7391	7561	7731	7901	8070	5
6	8240	8410	8579	8749	8918	9087	9257	9426	9595	9764	6
7	9933	0102	0271	0440	0609	0777	0946	1114	1283	1451	7
8	411620	1788	1956	2124	2293	2461	2629	2796	2964	3132	8
9	3300	3467	3635	3803	3970	4137	4305	4472	4639	4806	9
260	4973	5140	5307	5474	5641	5808	5974	6141	6308	6474	260
1	6641	6807	6973	7139	7306	7472	7638	7804	7970	8135	1
2	8301	8467	8633	8798	8964	9129	9295	9460	9625	9791	2
3	9956	0121	0286	0451	0616	0781	0945	1110	1275	1439	3
4	421604	1768	1933	2097	2261	2426	2590	2754	2918	3082	4
5	3246	3410	3574	3737	3901	4065	4228	4392	4555	4718	5
6	4882	5045	5208	5371	5534	5697	5860	6023	6186	6349	6
7	6511	6674	6836	6999	7161	7324	7486	7648	7811	7973	7
8	8135	8297	8459	8621	8783	8944	9106	9268	9429	9591	8
9	9752	9914	0075	0236	0398	0559	0720	0881	1042	1203	9

ПРОДОЛЖЕНИЕ ТАБЛИЦЫ.

N.	1	2	3	4	5	6	7	8	9
2433	17.8	35.6	53.4	71.2	89.0	106.8	124.6	142.4	160.2
2446	17.7	35.4	53.1	70.8	88.5	106.2	123.9	141.6	159.3
2460	17.6	35.2	52.8	70.4	88.0	105.6	123.2	140.8	158.4
2474	17.5	35.0	52.5	70.0	87.5	105.0	122.5	140.0	157.5
2488	17.4	34.8	52.2	69.6	87.0	104.4	121.8	139.2	156.6
2503	17.3	34.6	51.9	69.2	86.5	103.8	121.1	138.4	155.7
2517	17.2	34.4	51.6	68.8	86.0	103.2	120.4	137.6	154.8
2532	17.1	34.2	51.3	68.4	85.5	102.6	119.7	136.8	153.9
2547	17.0	34.0	51.0	68.0	85.0	102.0	119.0	136.0	153.0
2562	16.9	33.8	50.7	67.6	84.5	101.4	118.3	135.2	152.1
2577	16.8	33.6	50.4	67.2	84.0	100.8	117.6	134.4	151.2
2592	16.7	33.4	50.1	66.8	83.5	100.2	116.9	133.6	150.3
2608	16.6	33.2	49.8	66.4	83.0	99.6	116.2	132.8	149.4
2624	16.5	33.0	49.5	66.0	82.5	99.0	115.5	132.0	148.5
2640	16.4	32.8	49.2	65.6	82.0	98.4	114.8	131.2	147.6
2656	16.3	32.6	48.9	65.2	81.5	97.8	114.1	130.4	146.7
2672	16.2	32.4	48.5	64.8	81.0	97.2	113.4	129.6	145.8
2689	16.1	32.2	48.3	64.4	80.5	96.6	112.7	128.8	144.9

No. 270 L 431.] LOGARITHMS OF NUMBERS. [No. 299]									
N.	0	1	2	3	4	5	6	7	8
270	431364	1525	1685	1846	2007	2167	2328	2488	2649
1	2969	3130	3290	3450	3610	3770	3930	4090	4249
2	4569	4729	4888	5048	5207	5367	5526	5685	5844
3	6163	6322	6481	6640	6799	6957	7116	7275	7433
4	7751	7909	8067	8226	8384	8542	8701	8859	9017
5	9333	9491	9648	9806	9964	0122	0279	0437	0594
6	440909	1066	1224	1381	1538	1695	1852	2009	2166
7	2480	2637	2793	2950	3106	3263	3419	3576	3732
8	4045	4201	4357	4513	4669	4825	4981	5137	5293
9	5604	5760	5915	6071	6226	6382	6537	6692	6848
280	7158	7313	7468	7623	7778	7933	8088	8242	8397
1	8706	8861	9015	9170	9324	9478	9633	9787	9941
2	450249	0403	0557	0711	0865	1018	1172	1326	1479
3	1786	1940	2093	2247	2400	2553	2706	2859	3012
4	3318	3471	3624	3777	3930	4082	4235	4387	4540
5	4845	4997	5150	5302	5454	5606	5758	5910	6062
6	6366	6518	6670	6821	6973	7125	7276	7428	7579
7	7882	8033	8184	8336	8487	8638	8789	8940	9091
8	9392	9543	9694	9845	9995	0146	0296	0447	0597
9	460898	1048	1198	1348	1499	1649	1799	1948	2098
290	2398	2548	2697	2847	2997	3146	3296	3445	3594
1	3893	4042	4191	4340	4490	4639	4788	4936	5085
2	5383	5532	5680	5829	5977	6126	6274	6423	6571
3	6868	7016	7164	7312	7460	7608	7756	7904	8052
4	8347	8495	8643	8790	8938	9085	9233	9380	9527
5	9822	9969	0116	0263	0410	0557	0704	0851	0998
6	471292	1438	1585	1732	1878	2025	2171	2318	2464
7	2756	2903	3049	3195	3341	3487	3633	3779	3925
8	4216	4362	4508	4653	4799	4944	5090	5235	5381
9	5671	5816	5962	6107	6252	6397	6542	6687	6832
PROPORTIONAL PARTS.	N.	1	2	3	4	5	6	7	8
	2705	16'0	32'0	48'0	64'0	80'0	96'0	112'0	128
	2722	15'9	31'8	47'7	63'6	79'5	95'4	111'3	127
	2740	15'8	31'6	47'4	63'2	79'0	94'8	110'6	126
	2757	15'7	31'4	47'1	62'8	78'5	94'2	109'9	125
	2775	15'6	31'2	46'8	62'4	78'0	93'6	109'2	124
	2792	15'5	31'0	46'5	62'0	77'5	93'0	108'5	124
	2810	15'4	30'8	46'2	61'6	77'0	92'4	107'8	123
	2833	15'3	30'6	45'9	61'2	76'5	91'8	107'1	122
	2847	15'2	30'4	45'6	60'8	76'0	91'2	106'4	121
	2866	15'1	30'2	45'3	60'4	75'5	90'6	105'7	120
	2885	15'0	30'0	45'0	60'0	75'0	90'0	105'0	120
	2904	14'9	29'8	44'7	59'6	74'5	89'4	104'3	119
	2924	14'8	29'6	44'4	59'2	74'0	88'8	103'6	118
	2944	14'7	29'4	44'1	58'8	73'5	88'2	102'9	117
	2964	14'6	29'2	43'8	58'4	73'0	87'6	102'2	116
	2984	14'5	29'0	43'5	58'0	72'5	87'0	101'5	116
	3005	14'4	28'8	43'2	57'6	72'0	86'4	100'8	115
	3026	14'3	28'6	42'9	57'2	71'5	85'8	100'1	114
	3047	14'2	28'4	42'6	56'8	71'0	85'2	99'4	113
	3069	14'1	28'2	42'3	56'4	70'5	84'6	98'7	112
	3091	14'0	28'0	42'0	56'0	70'0	84'0	98'0	111

No. 300 L. 477.]

LOGARITHMS OF NUMBERS.

[No. 339 L. 531.]

N.	0	1	2	3	4	5	6	7	8	9	N.
300	477121	7266	7411	7555	7700	7844	7989	8133	8278	8422	300
1	8566	8711	8855	8999	9143	9287	9431	9575	9719	9863	1
2	480007	0151	0294	0438	0582	0725	0869	1012	1156	1299	2
3	1443	1586	1729	1872	2016	2159	2302	2445	2588	2731	3
4	2874	3016	3159	3302	3445	3587	3730	3872	4015	4157	4
5	4300	4442	4585	4727	4869	5011	5153	5295	5437	5579	5
6	5721	5863	6005	6147	6289	6430	6572	6714	6855	6997	6
7	7138	7280	7421	7563	7704	7845	7986	8127	8269	8410	7
8	8551	8692	8833	8974	9114	9255	9396	9537	9677	9818	8
9	9958	0099	0239	0380	0520	0661	0801	0941	1081	1222	9
310	491362	1502	1642	1782	1922	2062	2201	2341	2481	2621	310
1	2760	2900	3040	3179	3319	3458	3597	3737	3876	4015	1
2	4155	4294	4433	4572	4711	4850	4989	5128	5267	5406	2
3	5544	5683	5822	5960	6099	6238	6376	6515	6653	6791	3
4	6930	7068	7206	7344	7483	7621	7759	7897	8035	8173	4
5	8311	8448	8586	8724	8862	8999	9137	9275	9412	9550	5
6	9687	9824	9962	0099	0236	0374	0511	0648	0785	0922	6
7	501059	1196	1333	1470	1607	1744	1880	2017	2154	2291	7
8	2427	2564	2700	2837	2973	3109	3246	3382	3518	3655	8
9	3791	3927	4063	4199	4335	4471	4607	4743	4878	5014	9
320	5150	5286	5421	5557	5693	5828	5964	6099	6234	6370	320
1	6505	6640	6776	6911	7046	7181	7316	7451	7586	7721	1
2	7856	7991	8126	8260	8395	8530	8664	8799	8934	9068	2
3	9203	9337	9471	9606	9740	9874	0009	0143	0277	0411	3
4	510545	0679	0813	0947	1081	1215	1349	1482	1616	1750	4
5	1883	2017	2151	2284	2418	2551	2684	2818	2951	3084	5
6	3218	3351	3484	3617	3750	3883	4016	4149	4282	4415	6
7	4548	4681	4813	4946	5079	5211	5344	5476	5609	5741	7
8	5874	6006	6139	6271	6403	6535	6668	6800	6932	7064	8
9	7196	7328	7460	7592	7724	7855	7987	8119	8251	8382	9
330	8514	8646	8777	8909	9040	9171	9303	9434	9566	9697	330
1	9828	9959	0090	0221	0353	0485	0615	0745	0876	1007	1
2	521138	1269	1400	1530	1661	1792	1922	2053	2183	2314	2
3	2444	2575	2705	2835	2966	3096	3226	3356	3486	3616	3
4	3746	3876	4006	4136	4266	4396	4526	4656	4785	4915	4
5	5045	5174	5304	5434	5563	5693	5822	5951	6081	6210	5
6	6339	6469	6598	6727	6856	6985	7114	7243	7372	7501	6
7	7630	7759	7888	8016	8145	8274	8402	8531	8660	8788	7
8	8917	9045	9174	9302	9430	9559	9687	9815	9943	0072	8
9	530200	0328	0456	0584	0712	0840	0968	1096	1223	1351	9

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8	9
3113	13.9	27.8	41.7	55.6	69.5	83.4	97.3	111.2	125.1
3135	13.8	27.6	41.4	55.2	69.0	82.8	96.6	110.4	124.2
3158	13.7	27.4	41.1	54.8	68.5	82.2	95.9	109.6	123.3
3181	13.6	27.2	40.8	54.4	68.0	81.6	95.2	108.8	122.4
3205	13.5	27.0	40.5	54.0	67.5	81.0	94.5	108.0	121.5
3228	13.4	26.8	40.2	53.6	67.0	80.4	93.8	107.2	120.6
3253	13.3	26.6	39.9	53.2	66.5	79.8	93.1	106.4	119.7
3277	13.2	26.4	39.6	52.8	66.0	79.2	92.4	105.6	118.8
3302	13.1	26.2	39.3	52.4	65.5	78.6	91.7	104.8	117.9
3327	13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	117.0
3353	12.9	25.8	38.7	51.6	64.5	77.4	90.3	103.2	116.1

No. 415 L. 618.]

LOGARITHMS OF NUMBERS.

[No. 4

N.	0	1	2	3	4	5	6	7	8
415	618048	8153	8257	8362	8466	8571	8676	8780	8884
6	9093	9198	9302	9406	9511	9615	9719	9824	9928
7	620136	0240	0344	0448	0552	0656	0760	0864	0968
8	1176	1280	1384	1488	1592	1695	1799	1903	2007
9	2214	2318	2421	2525	2628	2732	2835	2939	3042
420	3249	3353	3456	3559	3663	3766	3869	3973	4076
1	4282	4385	4488	4591	4695	4798	4901	5004	5107
2	5312	5415	5518	5621	5724	5827	5929	6032	6135
3	6340	6443	6546	6648	6751	6853	6956	7058	7161
4	7366	7468	7571	7673	7775	7878	7980	8082	8185
5	8389	8491	8593	8695	8797	8900	9002	9104	9206
6	9410	9512	9613	9715	9817	9919	0021	0123	0224
7	630428	0530	0631	0733	0835	0936	1038	1139	1241
8	1444	1545	1647	1748	1849	1951	2052	2153	2255
9	2457	2559	2660	2761	2862	2963	3064	3165	3266
430	3468	3569	3670	3771	3872	3973	4074	4175	4276
1	4477	4578	4679	4779	4880	4981	5081	5182	5283
2	5484	5584	5685	5785	5886	5986	6087	6187	6287
3	6488	6588	6688	6789	6889	6989	7089	7189	7290
4	7490	7590	7690	7790	7890	7990	8090	8190	8290
5	8489	8589	8689	8789	8888	8988	9088	9188	9287
6	9486	9586	9686	9785	9885	9984	0084	0183	0283
7	640481	0581	0680	0779	0879	0978	1077	1177	1276
8	1474	1573	1672	1771	1871	1970	2069	2168	2267
9	2465	2563	2662	2761	2860	2959	3058	3156	3255
440	3453	3551	3650	3749	3847	3946	4044	4143	4242
1	4439	4537	4636	4734	4832	4931	5029	5127	5226
2	5422	5521	5619	5717	5815	5913	6011	6110	6208
3	6404	6502	6600	6698	6796	6894	6992	7089	7187
4	7383	7481	7579	7676	7774	7872	7969	8067	8165
5	8360	8458	8555	8653	8750	8848	8945	9043	9140
6	9335	9432	9530	9627	9724	9821	9919	0016	0113
7	650308	0405	0502	0599	0696	0793	0890	0987	1084
8	1278	1375	1472	1569	1666	1762	1859	1956	2053
9	2246	2343	2440	2536	2633	2730	2826	2923	3019
450	3213	3309	3405	3502	3598	3695	3791	3888	3984
1	4177	4273	4369	4465	4562	4658	4754	4850	4946
2	5138	5235	5331	5427	5523	5619	5715	5810	5906
3	6098	6194	6290	6386	6482	6577	6673	6769	6864
4	7056	7152	7247	7343	7438	7534	7629	7725	7820
5	8011	8107	8202	8298	8393	8488	8584	8679	8774
6	8965	9060	9155	9250	9346	9441	9536	9631	9726
7	9916	0011	0106	0201	0296	0391	0486	0581	0676
8	660865	0960	1055	1150	1245	1339	1434	1529	1623
9	1813	1907	2002	2096	2191	2286	2380	2475	2569
PROPORTIONAL PARTS.									
N.	1	2	3	4	5	6	7	8	9
4155	10.4	20.8	31.2	41.6	52.0	62.4	72.8	83.2	93.6
4196	10.3	20.6	30.9	41.2	51.5	61.8	72.1	82.4	92.7
4237	10.2	20.4	30.6	40.8	51.0	61.2	71.4	81.6	91.8
4278	10.1	20.2	30.3	40.4	50.5	60.6	70.7	80.8	90.9
4321	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0
4364	9.9	19.8	29.7	39.6	49.5	59.4	69.3	79.2	89.1

LOGARITHMS OF NUMBERS.									
[No. 499 L. 698.]									
o	1	2	3	4	5	6	7	8	9
662758	2852	2947	3041	3135	3230	3324	3418	3512	3607
3701	3795	3889	3983	4078	4172	4266	4360	4454	4548
4642	4736	4830	4924	5018	5112	5206	5299	5393	5487
5581	5675	5769	5862	5956	6050	6143	6237	6331	6424
6518	6612	6705	6799	6892	6986	7079	7173	7266	7360
7453	7546	7640	7733	7826	7920	8013	8106	8199	8293
8386	8479	8572	8665	8759	8852	8945	9038	9131	9224
9317	9410	9503	9596	9689	9782	9875	9967	0060	0153
670246	0339	0431	0524	0617	0710	0802	0895	0988	1080
1173	1265	1358	1451	1543	1636	1728	1821	1913	2005
2098	2190	2283	2375	2467	2560	2652	2744	2836	2929
3021	3113	3205	3297	3390	3482	3574	3666	3758	3850
3942	4034	4126	4218	4310	4402	4494	4586	4677	4769
4861	4953	5045	5137	5228	5320	5412	5503	5595	5687
5778	5870	5962	6053	6145	6236	6328	6419	6511	6602
6694	6785	6876	6968	7059	7151	7242	7333	7424	7516
7607	7698	7789	7881	7972	8063	8154	8245	8336	8427
8518	8609	8700	8791	8882	8973	9064	9155	9246	9337
9428	9519	9610	9700	9791	9882	9973	0063	0154	0245
680336	0426	0517	0607	0698	0789	0879	0970	1060	1151
1241	1332	1422	1513	1603	1693	1784	1874	1964	2055
2145	2235	2326	2416	2506	2596	2686	2777	2867	2957
3047	3137	3227	3317	3407	3497	3587	3677	3767	3857
3947	4037	4127	4217	4307	4396	4486	4576	4666	4756
4845	4935	5025	5114	5204	5294	5383	5473	5563	5652
5742	5831	5921	6010	6100	6189	6279	6368	6458	6547
6636	6726	6815	6904	6994	7083	7172	7261	7351	7440
7529	7618	7707	7796	7886	7975	8064	8153	8242	8331
8420	8509	8598	8687	8776	8865	8953	9042	9131	9220
9309	9398	9486	9575	9664	9753	9841	9930	0019	0107
690196	0285	0373	0462	0550	0639	0728	0816	0905	0993
1081	1170	1258	1347	1435	1524	1612	1700	1789	1877
1965	2053	2142	2230	2318	2406	2494	2583	2671	2759
2847	2935	3023	3111	3199	3287	3375	3463	3551	3639
3727	3815	3903	3991	4078	4166	4254	4342	4430	4517
4605	4693	4781	4868	4956	5044	5131	5219	5307	5394
5482	5569	5657	5744	5832	5919	6007	6094	6182	6269
6356	6444	6531	6618	6706	6793	6880	6968	7055	7142
7229	7317	7404	7491	7578	7665	7752	7839	7926	8014
8100	8188	8275	8362	8449	8535	8622	8709	8796	8883
HYPOTHETICAL PARTS.									
N.	1	2	3	4	5	6	7	8	9
4410	9°8	19°6	29°4	39°2	49°0	58°8	68°6	78°4	88°2
4454	9°7	19°4	29°1	38°8	48°5	58°2	67°9	77°6	87°3
4500	9°6	19°2	28°8	38°4	48°0	57°6	67°2	76°8	86°4
4547	9°5	19°0	28°5	38°0	47°5	57°0	66°5	76°0	85°5
4595	9°4	18°8	28°2	37°6	47°0	56°4	65°8	75°2	84°6
4644	9°3	18°6	27°9	37°2	46°5	55°8	65°1	74°4	83°7
4695	9°2	18°4	27°6	36°8	46°0	55°2	64°4	73°6	82°8
4746	9°1	18°2	27°3	36°4	45°5	54°6	63°7	72°8	81°9
4798	9°0	18°0	27°0	36°0	45°0	54°0	63°0	72°0	81°0
4852	8°9	17°8	26°7	35°6	44°5	53°4	62°3	71°2	80°1
4907	8°8	17°6	26°4	35°2	44°0	52°8	61°6	70°4	

No. 500 L. 698.]

LOGARITHMS OF NUMBERS.

[No. 544.]

N.	0	1	2	3	4	5	6	7	8	9
500	698970	9057	9144	9231	9317	9404	9491	9578	9664	9751
1	9838	9924	0011	0098	0184	0271	0358	0444	0531	0618
2	700704	0790	0877	0963	1050	1136	1222	1309	1395	1482
3	1568	1654	1741	1827	1913	1999	2086	2172	2258	2345
4	2431	2517	2603	2689	2775	2861	2947	3033	3119	3205
5	3291	3377	3463	3549	3635	3721	3807	3893	3979	4065
6	4151	4236	4322	4408	4494	4579	4665	4751	4837	4923
7	5008	5094	5179	5265	5350	5436	5522	5607	5693	5779
8	5864	5949	6035	6120	6206	6291	6376	6462	6547	6633
9	6718	6803	6888	6974	7059	7144	7229	7315	7400	7486
510	7570	7655	7740	7826	7911	7996	8081	8166	8251	8337
1	8421	8506	8591	8676	8761	8846	8931	9015	9100	9186
2	9270	9355	9440	9524	9609	9694	9779	9863	9948	0033
3	710117	0202	0287	0371	0456	0540	0625	0710	0794	0879
4	0963	1048	1132	1217	1301	1385	1470	1554	1639	1723
5	1807	1892	1976	2060	2144	2229	2313	2397	2481	2566
6	2650	2734	2818	2902	2986	3070	3154	3238	3322	3406
7	3491	3575	3659	3742	3826	3910	3994	4078	4162	4246
8	4330	4414	4497	4581	4665	4749	4833	4916	5000	5084
9	5167	5251	5335	5418	5502	5586	5669	5753	5836	5920
520	6003	6087	6170	6254	6337	6421	6504	6588	6671	6755
1	6838	6921	7004	7088	7171	7254	7338	7421	7504	7588
2	7671	7754	7837	7920	8003	8086	8169	8253	8336	8419
3	8502	8585	8668	8751	8834	8917	9000	9083	9165	9248
4	9331	9414	9497	9580	9663	9745	9828	9911	9994	0077
5	720159	0242	0325	0407	0490	0573	0655	0738	0821	0904
6	0986	1068	1151	1233	1316	1398	1481	1563	1646	1728
7	1811	1893	1975	2058	2140	2222	2305	2387	2469	2551
8	2634	2716	2798	2881	2963	3045	3127	3209	3291	3373
9	3456	3538	3620	3702	3784	3866	3948	4030	4112	4194
530	4276	4358	4440	4522	4604	4685	4767	4849	4931	5013
1	5095	5176	5258	5340	5422	5503	5585	5667	5748	5830
2	5912	5993	6075	6156	6238	6320	6401	6483	6564	6646
3	6727	6809	6890	6972	7053	7134	7216	7297	7379	7460
4	7541	7623	7704	7785	7866	7948	8029	8110	8191	8272
5	8354	8435	8516	8597	8678	8759	8841	8922	9003	9084
6	9165	9246	9327	9408	9489	9570	9651	9732	9813	9894
7	9974	0055	0136	0217	0298	0379	0459	0540	0621	0702
8	730782	0863	0944	1024	1105	1186	1266	1347	1428	1509
9	1589	1669	1750	1830	1911	1991	2072	2152	2233	2314
540	2394	2474	2555	2635	2715	2796	2876	2956	3037	3117
1	3197	3278	3358	3438	3518	3598	3679	3759	3839	3919
2	3999	4079	4160	4240	4320	4400	4480	4560	4640	4720
3	4800	4880	4960	5040	5120	5199	5279	5359	5439	5519
4	5599	5679	5759	5838	5918	5998	6078	6157	6237	6317

PROP. PARTS.

N.	1	2	3	4	5	6	7	8
4963	8'7	17'4	26'1	34'8	43'5	52'2	60'9	69'6
5020	8'6	17'2	25'8	34'4	43'0	51'6	60'2	68'8
5079	8'5	17'0	25'5	34'0	42'5	51'0	59'5	68'1
5139	8'4	16'8	25'2	33'6	42'0	50'4	58'8	67'4

No. 545 L. 736.]

LOGARITHMS OF NUMBERS.

[No. 584 L. 767.]

N.	0	1	2	3	4	5	6	7	8	9	N.
545	736397	6476	6556	6635	6715	6795	6874	6954	7034	7113	545
6	7193	7272	7552	7431	7511	7590	7670	7749	7829	7908	6
7	7987	8067	8146	8225	8305	8384	8463	8543	8622	8701	7
8	8781	8860	8959	9018	9097	9177	9256	9335	9414	9493	8
9	9572	9651	9731	9810	9889	9968	0047	0126	0205	0284	9
550	740363	0442	0521	0600	0678	0757	0836	0915	0994	1073	550
1	1152	1230	1309	1388	1467	1546	1624	1703	1782	1860	1
2	1939	2018	2096	2175	2254	2332	2411	2489	2568	2647	2
3	2725	2804	2882	2961	3039	3118	3196	3275	3353	3431	3
4	3510	3588	3667	3745	3823	3902	3980	4058	4136	4215	4
5	4293	4371	4449	4528	4606	4684	4762	4840	4919	4997	5
6	5075	5153	5231	5309	5387	5465	5543	5621	5699	5777	6
7	5855	5933	6011	6089	6167	6245	6323	6401	6479	6556	7
8	6634	6712	6790	6868	6945	7023	7101	7179	7256	7334	8
9	7412	7489	7567	7645	7722	7800	7878	7955	8033	8110	9
560	8188	8266	8343	8421	8498	8576	8653	8731	8808	8885	560
1	8963	9040	9118	9195	9272	9350	9427	9504	9582	9659	1
2	9736	9814	9891	9968	0045	0123	0200	0277	0354	0431	2
3	750508	0586	0663	0740	0817	0894	0971	1048	1125	1202	3
4	1279	1356	1433	1510	1587	1664	1741	1818	1895	1972	4
5	2048	2125	2202	2279	2356	2433	2509	2586	2663	2740	5
6	2816	2893	2970	3047	3123	3200	3277	3353	3430	3506	6
7	3583	3660	3736	3813	3889	3966	4042	4119	4195	4272	7
8	4348	4425	4501	4578	4654	4730	4807	4883	4960	5036	8
9	5112	5189	5265	5341	5417	5494	5570	5646	5722	5799	9
570	5875	5951	6027	6103	6180	6256	6332	6408	6484	6560	570
1	6636	6712	6788	6864	6940	7016	7092	7168	7244	7320	1
2	7396	7472	7548	7624	7700	7775	7851	7927	8003	8079	2
3	8155	8230	8306	8382	8458	8533	8609	8685	8761	8836	3
4	8912	8988	9063	9139	9214	9290	9366	9441	9517	9592	4
5	9668	9743	9819	9894	9970	0045	0121	0196	0272	0347	5
6	760422	0498	0573	0649	0724	0799	0875	0950	1025	1101	6
7	1176	1251	1326	1402	1477	1552	1627	1702	1778	1853	7
8	1928	2003	2078	2153	2228	2303	2378	2453	2529	2604	8
9	2679	2754	2829	2904	2978	3053	3128	3203	3278	3353	9
580	3428	3503	3578	3653	3727	3802	3877	3952	4027	4101	580
1	4176	4251	4326	4400	4475	4550	4624	4699	4774	4848	1
2	4923	4998	5072	5147	5221	5296	5370	5445	5520	5594	2
3	5669	5743	5818	5892	5966	6041	6115	6190	6264	6338	3
4	6413	6487	6562	6636	6710	6785	6859	6933	7007	7082	4

PROPORTIONAL PARTS.

N.	1	2	3	4	5	6	7	8	9
5201	8.3	16.6	24.9	33.2	41.5	49.8	58.1	66.4	74.7
5264	8.2	16.4	24.6	32.8	41.0	49.2	57.4	65.6	73.8
5328	8.1	16.2	24.3	32.4	40.5	48.6	56.7	64.8	72.9
5392	8.0	16.0	24.0	32.0	40.0	48.0	56.0	64.0	72.0
5462	7.9	15.8	23.7	31.6	39.5	47.4	55.3	63.2	71.1
5532	7.8	15.6	23.4	31.2	39.0	46.8	54.6	62.4	70.2
5603	7.7	15.4	23.1	30.8	38.5	46.2	53.9	61.6	69.3
5677	7.6	15.2	22.8	30.4	38.0	45.6	53.2	60.8	68.4
5752	7.5	15.0	22.5	30.0	37.5	45.0	52.5	60.0	67.5
5829	7.4	14.8	22.2	29.6	37.0	44.4	51.8	59.2	

No. 585 L. 767.] LOGARITHMS OF NUMBERS. [No. 62

N.	0	1	2	3	4	5	6	7	8
585	767156	7230	7304	7379	7453	7527	7601	7675	7749
6	7898	7972	8046	8120	8194	8268	8342	8416	8490
7	8638	8712	8786	8860	8934	9008	9082	9156	9230
8	9377	9451	9525	9599	9673	9746	9820	9894	9968
9	770115	0189	0263	0336	0410	0484	0557	0631	0705
590	0852	0926	0999	1073	1146	1220	1293	1367	1440
1	1587	1661	1734	1808	1881	1955	2028	2102	2175
2	2322	2395	2468	2542	2615	2688	2762	2835	2908
3	3055	3128	3201	3274	3348	3421	3494	3567	3640
4	3786	3860	3933	4006	4079	4152	4225	4298	4371
5	4517	4590	4663	4736	4809	4882	4955	5028	5100
6	5246	5319	5392	5465	5538	5610	5683	5756	5829
7	5974	6047	6120	6193	6265	6338	6411	6483	6556
8	6701	6774	6846	6919	6992	7064	7137	7209	7282
9	7427	7499	7572	7644	7717	7789	7862	7934	8006
600	8151	8224	8296	8368	8441	8513	8585	8658	8730
1	8874	8947	9019	9091	9163	9236	9308	9380	9452
2	9596	9669	9741	9813	9885	9957	0029	0101	0173
3	780317	0389	0461	0533	0605	0677	0749	0821	0893
4	1037	1109	1181	1253	1324	1396	1468	1540	1612
5	1755	1827	1899	1971	2042	2114	2186	2258	2329
6	2473	2544	2616	2688	2759	2831	2902	2974	3046
7	3189	3260	3332	3403	3475	3546	3618	3689	3761
8	3904	3975	4046	4118	4189	4261	4332	4403	4475
9	4617	4689	4760	4831	4902	4974	5045	5116	5187
610	5330	5401	5472	5543	5615	5686	5757	5828	5899
1	6041	6112	6183	6254	6325	6396	6467	6538	6609
2	6751	6822	6893	6964	7035	7106	7177	7248	7319
3	7460	7531	7602	7673	7744	7815	7885	7956	8027
4	8168	8239	8310	8381	8451	8522	8593	8663	8734
5	8875	8946	9016	9087	9157	9228	9299	9369	9440
6	9581	9651	9722	9792	9863	9933	0004	0074	0144
7	790285	0356	0426	0496	0567	0637	0707	0778	0848
8	0988	1059	1129	1199	1269	1340	1410	1480	1550
9	1691	1761	1831	1901	1971	2041	2111	2181	2252
620	2392	2462	2532	2602	2672	2742	2812	2882	2952
1	3092	3162	3231	3301	3371	3441	3511	3581	3651
2	3790	3860	3930	4000	4070	4139	4209	4279	4349
3	4488	4558	4627	4697	4767	4836	4906	4976	5045
4	5185	5254	5324	5393	5463	5532	5602	5672	5741
5	5880	5949	6019	6088	6158	6227	6297	6366	6436
6	6574	6644	6713	6782	6852	6921	6990	7060	7129
7	7268	7337	7406	7475	7545	7614	7683	7752	7821
8	7960	8029	8098	8167	8236	8305	8374	8443	8513
9	8651	8720	8789	8858	8927	8996	9065	9134	9203

PROP. PARTS.

N.	1	2	3	4	5	6	7
5908	7'3	14'6	21'9	29'2	36'5	43'8	51'1
5990	7'2	14'4	21'6	28'8	36'0	43'2	50'4
6074	7'1	14'2	21'3	28'4	35'5	42'6	49'7
6160	7'0	14'0	21'0	28'0	35'0	42'0	49'0
6248	6'9	13'8	20'7	27'6	34'5	41'4	48'3

No. 630 L. 799.]

LOGARITHMS OF NUMBERS.

[No. 674 L. 829.]

	0	1	2	3	4	5	6	7	8	9	N.
799341	9409	9478	9547	9616	9685	9754	9823	9892	9961	630	
800039	0098	0167	0236	0305	0373	0442	0511	0580	0648	1	
0717	0786	0854	0923	0992	1061	1129	1198	1266	1335	2	
1404	1472	1541	1609	1678	1747	1815	1884	1952	2021	3	
2089	2158	2226	2295	2363	2432	2500	2568	2637	2705	4	
2774	2842	2910	2979	3047	3116	3184	3252	3321	3389	5	
3457	3525	3594	3662	3730	3798	3867	3935	4003	4071	6	
4139	4208	4276	4344	4412	4480	4548	4616	4685	4753	7	
4821	4889	4957	5025	5093	5161	5229	5297	5365	5433	8	
5501	5569	5637	5705	5773	5841	5908	5976	6044	6112	9	
806180	6248	6316	6384	6451	6519	6587	6655	6723	6790	640	
6858	6926	6994	7061	7129	7197	7264	7332	7400	7467	1	
7535	7603	7670	7738	7806	7873	7941	8008	8076	8143	2	
8211	8279	8346	8414	8481	8549	8616	8684	8751	8818	3	
8886	8953	9021	9088	9156	9223	9290	9358	9425	9492	4	
9560	9627	9694	9762	9829	9896	9964	0031	0098	0165	5	
810233	0300	0367	0434	0501	0569	0636	0703	0770	0837	6	
0904	0971	1039	1106	1173	1240	1307	1374	1441	1508	7	
1575	1642	1709	1776	1843	1910	1977	2044	2111	2178	8	
2245	2312	2379	2445	2512	2579	2646	2713	2780	2847	9	
2913	2980	3047	3114	3181	3247	3314	3381	3448	3514	650	
3581	3648	3714	3781	3848	3914	3981	4048	4114	4181	1	
4248	4314	4381	4447	4514	4581	4647	4714	4780	4847	2	
4913	4980	5046	5113	5179	5246	5312	5378	5445	5511	3	
5578	5644	5711	5777	5843	5910	5976	6042	6109	6175	4	
6241	6308	6374	6440	6506	6573	6639	6705	6771	6838	5	
6904	6970	7036	7102	7169	7235	7301	7367	7433	7499	6	
7565	7631	7698	7764	7830	7896	7962	8028	8094	8160	7	
8226	8292	8358	8424	8490	8556	8622	8688	8754	8820	8	
8885	8951	9017	9083	9149	9215	9281	9346	9412	9478	9	
9544	9610	9676	9741	9807	9873	9939	0004	0070	0136	660	
820201	0267	0333	0399	0464	0530	0595	0661	0727	0792	1	
0858	0924	0989	1055	1120	1186	1251	1317	1382	1448	2	
1514	1579	1645	1710	1775	1841	1906	1972	2037	2103	3	
2168	2233	2299	2364	2430	2495	2560	2626	2691	2756	4	
2822	2887	2952	3018	3083	3148	3213	3279	3344	3409	5	
3474	3539	3605	3670	3735	3800	3865	3930	3996	4061	6	
4126	4191	4256	4321	4386	4451	4516	4581	4646	4711	7	
4776	4841	4906	4971	5036	5101	5166	5231	5296	5361	8	
5426	5491	5556	5621	5686	5751	5815	5880	5945	6010	9	
6075	6140	6204	6269	6334	6399	6464	6528	6593	6658	670	
6723	6787	6852	6917	6981	7046	7111	7175	7240	7305	1	
7369	7434	7499	7563	7628	7692	7757	7821	7886	7951	2	
8015	8080	8144	8209	8273	8338	8402	8467	8531	8595	3	
8660	8724	8789	8853	8918	8982	9046	9111	9175	9239	4	

LOG. TABLE.	N.	1	2	3	4	5	6	7	8	9
6340	6·8	13·6	20·4	27·2	34·0	40·8	47·6	54·4	61·2	
6433	6·7	13·4	20·1	26·8	33·5	40·2	46·9	53·6	60·3	
6530	6·6	13·2	19·8	26·4	33·0	39·6	46·2	52·8	59·4	
6630	6·5	13·0	19·5	26·0	32·5	39·0	45·5	52·0	58·5	
6733	6·4	12·8	19·2	25·6	32·0	38·4	44·8	51·2	57·6	

No. 765 L. 883.] LOGARITHMS OF NUMBERS. [No. 809 L. 901

N.	0	1	2	3	4	5	6	7	8	9	N
765	883661	3718	3775	3832	3888	3945	4002	4059	4115	4172	766
6	4229	4285	4342	4399	4455	4512	4569	4625	4682	4739	
7	4795	4852	4909	4965	5022	5078	5135	5192	5248	5305	
8	5361	5418	5474	5531	5587	5644	5700	5757	5813	5870	
9	5926	5983	6039	6096	6152	6209	6265	6321	6378	6434	
770	6491	6547	6604	6660	6716	6773	6829	6885	6942	6998	771
1	7054	7111	7167	7223	7280	7336	7392	7449	7505	7561	
2	7617	7674	7730	7786	7842	7898	7955	8011	8067	8123	
3	8179	8236	8292	8348	8404	8460	8516	8573	8629	8685	
4	8741	8797	8853	8909	8965	9021	9077	9134	9190	9246	
5	9302	9358	9414	9470	9526	9582	9638	9694	9750	9806	
6	9862	9918	9974	0030	0086	0141	0197	0253	0309	0365	
7	890421	0477	0533	0589	0645	0700	0756	0812	0868	0924	
8	0980	1035	1091	1147	1203	1259	1314	1370	1426	1482	
9	1537	1593	1649	1705	1760	1816	1872	1928	1983	2039	
780	2095	2150	2206	2262	2317	2373	2429	2484	2540	2595	
1	2651	2707	2762	2818	2873	2929	2985	3040	3096	3151	
2	3207	3262	3318	3373	3429	3484	3540	3595	3651	3706	
3	3762	3817	3873	3928	3984	4039	4094	4150	4205	4261	
4	4316	4371	4427	4482	4538	4593	4648	4704	4759	4814	
5	4870	4925	4980	5036	5091	5146	5201	5257	5312	5367	
6	5423	5478	5533	5588	5644	5699	5754	5809	5864	5920	
7	5975	6030	6085	6140	6195	6251	6306	6361	6416	6471	
8	6526	6581	6636	6692	6747	6802	6857	6912	6967	7022	
9	7077	7132	7187	7242	7297	7352	7407	7462	7517	7572	
790	7627	7682	7737	7792	7847	7902	7957	8012	8067	8122	
1	8176	8231	8286	8341	8396	8451	8506	8561	8615	8670	
2	8725	8780	8835	8890	8944	8999	9054	9109	9164	9218	
3	9273	9328	9383	9437	9492	9547	9602	9656	9711	9766	
4	9821	9875	9930	9985	0039	0094	0149	0203	0258	0312	
5	900367	0422	0476	0531	0586	0640	0695	0749	0804	0859	
6	0913	0968	1022	1077	1131	1186	1240	1295	1349	1404	
7	1458	1513	1567	1622	1676	1731	1785	1840	1894	1948	
8	2003	2057	2112	2166	2221	2275	2329	2384	2438	2492	
9	2547	2601	2655	2710	2764	2818	2873	2927	2981	3036	
800	3090	3144	3199	3253	3307	3361	3416	3470	3524	3578	
1	3633	3687	3741	3795	3849	3904	3958	4012	4066	4120	
2	4174	4229	4283	4337	4391	4445	4499	4553	4607	4661	
3	4716	4770	4824	4878	4932	4986	5040	5094	5148	5202	
4	5256	5310	5364	5418	5472	5526	5580	5634	5688	5742	
5	5796	5850	5904	5958	6012	6066	6119	6173	6227	6281	
6	6335	6389	6443	6497	6551	6604	6658	6712	6766	6820	
7	6874	6927	6981	7035	7089	7143	7196	7250	7304	7358	
8	7411	7465	7519	7573	7626	7680	7734	7787	7841	7895	
9	7949	8002	8056	8109	8163	8217	8270	8324	8378	8432	

PROP.
PARTS.

N.	1	2	3	4	5	6	7	8
7686	5'6	11'2	16'8	22'4	28'0	33'6	39'2	44'8
7825	5'5	11'0	16'5	22'0	27'5	33'0	38'5	44'0
7968	5'4	10'8	16'2	21'6	27'0	32'4	37'8	43'2

No. 810 L. 908.]

LOGARITHMS OF NUMBERS.

[No. 854 L. 931.]

N.	0	1	2	3	4	5	6	7	8	9	N.
10	908485	8539	8592	8646	8699	8753	8807	8860	8914	8967	810
1	9021	9074	9128	9181	9235	9289	9342	9396	9449	9503	1
2	9556	9609	9663	9716	9770	9823	9877	9930	9984	0037	2
3	910091	0144	0197	0251	0304	0358	0411	0464	0518	0571	3
4	0624	0678	0731	0784	0838	0891	0944	0998	1051	1104	4
5	1158	1211	1264	1317	1371	1424	1477	1530	1584	1637	5
6	1690	1743	1797	1850	1903	1956	2009	2063	2116	2169	6
7	2222	2275	2328	2381	2435	2488	2541	2594	2647	2700	7
8	2753	2806	2859	2913	2966	3019	3072	3125	3178	3231	8
9	3284	3337	3390	3443	3496	3549	3602	3655	3708	3761	9
10	3814	3867	3920	3973	4026	4079	4132	4184	4237	4290	820
1	4343	4396	4449	4502	4555	4608	4660	4713	4766	4819	1
2	4872	4925	4977	5030	5083	5136	5189	5241	5294	5347	2
3	5400	5453	5505	5558	5611	5664	5716	5769	5822	5875	3
4	5927	5980	6033	6085	6138	6191	6243	6296	6349	6401	4
5	6454	6507	6559	6612	6664	6717	6770	6822	6875	6927	5
6	6980	7033	7085	7138	7190	7243	7295	7348	7400	7453	6
7	7506	7558	7611	7663	7716	7768	7820	7873	7925	7978	7
8	8030	8083	8135	8188	8240	8293	8345	8397	8450	8502	8
9	8555	8607	8659	8712	8764	8816	8869	8921	8973	9026	9
10	9078	9130	9183	9235	9287	9340	9392	9444	9496	9549	830
1	9601	9653	9706	9758	9810	9862	9914	9967	0019	0071	1
2	920123	0176	0228	0280	0332	0384	0436	0489	0541	0593	2
3	0645	0697	0749	0801	0853	0906	0958	1010	1062	1114	3
4	1166	1218	1270	1322	1374	1426	1478	1530	1582	1634	4
5	1686	1738	1790	1842	1894	1946	1998	2050	2102	2154	5
6	2206	2258	2310	2362	2414	2466	2518	2570	2622	2674	6
7	2725	2777	2829	2881	2933	2985	3037	3089	3140	3192	7
8	3244	3296	3348	3399	3451	3503	3555	3607	3658	3710	8
9	3762	3814	3865	3917	3969	4021	4072	4124	4176	4228	9
10	4279	4331	4383	4434	4486	4538	4589	4641	4693	4744	840
1	4796	4848	4899	4951	5003	5054	5106	5157	5209	5261	1
2	5312	5364	5415	5467	5518	5570	5621	5673	5725	5776	2
3	5828	5879	5931	5982	6034	6085	6137	6188	6239	6291	3
4	6342	6394	6445	6497	6548	6600	6651	6702	6754	6805	4
5	6857	6908	6959	7011	7062	7114	7165	7216	7268	7319	5
6	7370	7422	7473	7524	7576	7627	7678	7730	7781	7832	6
7	7883	7935	7986	8037	8088	8140	8191	8242	8293	8345	7
8	8396	8447	8498	8549	8601	8652	8703	8754	8805	8857	8
9	8908	8959	9010	9061	9112	9163	9215	9266	9317	9368	9
10	9419	9470	9521	9572	9623	9674	9725	9776	9827	9879	850
1	9930	9981	0032	0083	0134	0185	0236	0287	0338	0389	1
2	30440	0491	0542	0592	0643	0694	0745	0796	0847	0898	2
3	0949	1000	1051	1102	1153	1203	1254	1305	1356	1407	3
4	1458	1509	1560	1610	1661	1712	1763	1814	1864	1915	4

N.	1	2	3	4	5	6	7	8	9
8117	5'3	10'6	15'9	21'2	26'5	31'8	37'1	42'4	47'7
8271	5'2	10'4	15'6	20'8	26'0	31'2	36'4	41'6	46'8
8432	5'1	10'2	15'3	20'4	25'5	30'6	35'7	40'8	45'9

No. 945 L. 975.]

LOGARITHMS OF NUMBERS.

[No. 989 L. 995]

N.	0	1	2	3	4	5	6	7	8	9	N.
945	975432	5478	5524	5570	5616	5662	5707	5753	5799	5845	945
6	5891	5937	5983	6029	6075	6121	6167	6212	6258	6304	6
7	6350	6396	6442	6488	6533	6579	6625	6671	6717	6763	7
8	6808	6854	6900	6946	6992	7037	7083	7129	7175	7220	8
9	7266	7312	7358	7403	7449	7495	7541	7586	7632	7678	9
950	7724	7769	7815	7861	7906	7952	7998	8043	8089	8135	950
1	8181	8226	8272	8317	8363	8409	8454	8500	8546	8591	1
2	8637	8683	8728	8774	8819	8865	8911	8956	9002	9047	2
3	9093	9138	9184	9230	9275	9321	9366	9412	9457	9503	3
4	9548	9594	9639	9685	9730	9776	9821	9867	9912	9958	4
5	980003	0049	0094	0140	0185	0231	0276	0322	0367	0412	5
6	0458	0503	0549	0594	0640	0685	0730	0776	0821	0867	6
7	0912	0957	1003	1048	1093	1139	1184	1229	1275	1320	7
8	1366	1411	1456	1501	1547	1592	1637	1683	1728	1773	8
9	1819	1864	1909	1954	2000	2045	2090	2135	2181	2226	9
960	2271	2316	2362	2407	2452	2497	2543	2588	2633	2678	960
1	2723	2769	2814	2859	2904	2949	2994	3040	3085	3130	1
2	3175	3220	3265	3310	3356	3401	3446	3491	3536	3581	2
3	3626	3671	3716	3762	3807	3852	3897	3942	3987	4032	3
4	4077	4122	4167	4212	4257	4302	4347	4392	4437	4482	4
5	4527	4572	4617	4662	4707	4752	4797	4842	4887	4932	5
6	4977	5022	5067	5112	5157	5202	5247	5292	5337	5382	6
7	5426	5471	5516	5561	5606	5651	5696	5741	5786	5830	7
8	5875	5920	5965	6010	6055	6100	6144	6189	6234	6279	8
9	6324	6369	6413	6458	6503	6548	6593	6637	6682	6727	9
970	6772	6817	6861	6906	6951	6996	7040	7085	7130	7175	970
1	7219	7264	7309	7353	7398	7443	7488	7532	7577	7622	1
2	7666	7711	7756	7800	7845	7890	7934	7979	8024	8068	2
3	8113	8157	8202	8247	8291	8336	8381	8425	8470	8514	3
4	8559	8604	8648	8693	8737	8782	8826	8871	8916	8960	4
5	9005	9049	9094	9138	9183	9227	9272	9316	9361	9405	5
6	9450	9494	9539	9583	9628	9672	9717	9761	9806	9850	6
7	9895	9939	9983	0028	0072	0117	0161	0206	0250	0294	7
8	990339	0383	0428	0472	0516	0561	0605	0650	0694	0738	8
9	0783	0827	0871	0916	0960	1004	1049	1093	1137	1182	9
980	1226	1270	1315	1359	1403	1448	1492	1536	1580	1625	980
1	1669	1713	1758	1802	1846	1890	1935	1979	2023	2067	1
2	2111	2156	2200	2244	2288	2333	2377	2421	2465	2509	2
3	2554	2598	2642	2686	2730	2774	2819	2863	2907	2951	3
4	2995	3039	3083	3127	3172	3216	3260	3304	3348	3392	4
5	3436	3480	3524	3568	3613	3657	3701	3745	3789	3833	5
6	3877	3921	3965	4009	4053	4097	4141	4185	4229	4273	6
7	4317	4361	4405	4449	4493	4537	4581	4625	4669	4713	7
8	4757	4801	4845	4889	4933	4977	5021	5065	5108	5152	8
9	5196	5240	5284	5328	5372	5416	5460	5504	5547	5591	9

Prop.
P. Arts.

N.	1	2	3	4	5	6	7	8	9
9759	4.4	8.8	13.2	17.6	22.0	26.4	30.8	35.2	39.6
9983	4.3	8.6	12.9	17.2	21.5	25.8	30.1	34.4	38.7

No. 990 L. 995.] LOGARITHMS OF NUMBERS. [No. 999 L. 999.]

N.	0	1	2	3	4	5	6	7	8	9	N.
990	995635	5679	5723	5767	5811	5854	5898	5942	5986	6030	990
1	6074	6117	6161	6205	6249	6293	6337	6380	6424	6468	1
2	6512	6555	6599	6643	6687	6731	6774	6818	6862	6906	2
3	6949	6993	7037	7080	7124	7168	7212	7255	7299	7343	3
4	7386	7430	7474	7517	7561	7605	7648	7692	7736	7779	4
5	7823	7867	7910	7954	7998	8041	8085	8129	8172	8216	5
6	8259	8303	8347	8390	8434	8477	8521	8564	8608	8652	6
7	8695	8739	8782	8826	8869	8913	8956	9000	9043	9087	7
8	9130	9174	9218	9261	9305	9348	9392	9435	9479	9522	8
9	9565	9609	9652	9696	9739	9783	9826	9870	9913	9957	9

TABLE II.—LOGARITHMS OF NUMBERS FROM 1 TO 100.

N.	Log.	N.	Log.	N.	Log.	N.	Log.	N.	Log.
1	0.000000	21	1.322219	41	1.612784	61	1.785330	81	1.908485
2	0.301030	22	1.342423	42	1.623249	62	1.792392	82	1.913814
3	0.477121	23	1.361728	43	1.633468	63	1.799341	83	1.919078
4	0.602060	24	1.380211	44	1.643453	64	1.806180	84	1.924279
5	0.698970	25	1.397940	45	1.653213	65	1.812913	85	1.929419
6	0.778151	26	1.414973	46	1.662758	66	1.819544	86	1.934498
7	0.845098	27	1.431364	47	1.672098	67	1.826075	87	1.939519
8	0.903090	28	1.447158	48	1.681241	68	1.832509	88	1.944483
9	0.954243	29	1.462398	49	1.690196	69	1.838849	89	1.949390
10	1.000000	30	1.477121	50	1.698970	70	1.845098	90	1.954243
11	1.041393	31	1.491362	51	1.707573	71	1.851258	91	1.959041
12	1.079181	32	1.505150	52	1.716003	72	1.857332	92	1.963788
13	1.113943	33	1.518514	53	1.724276	73	1.863323	93	1.968483
14	1.146128	34	1.531479	54	1.732394	74	1.869232	94	1.973128
15	1.176091	35	1.544068	55	1.740363	75	1.875061	95	1.977724
16	1.204120	36	1.556302	56	1.748188	76	1.880814	96	1.982271
17	1.230449	37	1.568202	57	1.755875	77	1.886491	97	1.986772
18	1.255273	38	1.579784	58	1.763428	78	1.892095	98	1.991226
19	1.278754	39	1.591065	59	1.770852	79	1.897627	99	1.995635
20	1.301030	40	1.602060	60	1.778151	80	1.903090	100	2.000000

TABLE III.

	Value at 0°.	Sign in 1st Quad.	Value at 90°.	Sign in 2nd Quad.	Value at 180°.	Sign in 3rd Quad.	Value at 270°.	Sign in 4th Quad.	Value at 360°.
Sin	0	+	R	+	0	—	R	—	0
Tan	0	+	∞	—	0	+	∞	—	0
Sec	R	+	∞	—	R	—	∞	+	R
Versin ..	0	+	R	+	2 R	+	R	+	0
Cos	R	+	0	—	R	—	0	+	R
Cot	∞	+	0	—	∞	+	0	—	∞
Cosec...	∞	+	R	+	∞	—	R	—	∞

R signifies equal to rad; *∞* signifies infinite; 0 signifies evanescent.

TABLE IV.—LOGARITHMIC SINES.

	'0	'1	'2	'3	'4	'5	
0 45	8.116926	8.117890	8.118852	8.119812	8.120769	8.121725	89 14
46	126471	127414	128355	129294	130231	131166	13
47	135810	136733	137654	138574	139491	140406	12
48	144953	145857	146759	147659	148557	149453	11
49	153907	154793	155676	156558	157438	158316	10
50	162681	163548	164414	165279	166141	167002	9
51	171280	172131	172980	173827	174673	175517	8
52	179713	180547	181380	182211	183041	183868	7
53	187985	188803	189620	190436	191250	192062	89 6
0 54	8.196102	8.196905	8.197707	8.198508	8.199307	8.200104	5
55	204070	204859	205646	206432	207217	208000	4
56	211895	212670	213443	214215	214986	215755	3
57	219581	220342	221102	221861	222618	223374	2
58	227134	227882	228628	229374	230118	230861	1
59	234557	235292	236026	236759	237491	238221	89 0
1 0	241855	242578	243300	244021	244741	245459	59
1 1	249033	249744	250455	251164	251871	252578	58
2	256094	256794	257492	258190	258887	259582	89 57
1 3	8.263042	8.263731	8.264419	8.265105	8.265791	8.266475	56
4	269881	270559	271236	271912	272587	273260	55
5	276614	277281	277948	278613	279278	279941	54
6	283243	283901	284557	285213	285867	286521	53
7	289773	290421	291068	291713	292358	293002	52
8	296207	296845	297482	298118	298754	299388	51
9	302546	303174	303803	304430	305056	305681	50
10	308794	309414	310033	310651	311268	311885	49
11	314954	315565	316175	316784	317393	318001	89 48
1 12	8.321027	8.321629	8.322231	8.322832	8.323433	8.324032	47
13	327016	327611	328204	328797	329389	329980	46
14	332924	333511	334096	334681	335265	335848	45
15	338753	339331	339909	340486	341063	341638	44
16	344504	345075	345645	346215	346784	347352	43
17	350181	350744	351307	351869	352430	352991	42
18	355783	356340	356895	357450	358004	358558	41
19	361315	361864	362413	362961	363508	364054	40
20	366777	367319	367861	368402	368943	369482	89 39
1 21	8.372171	8.372707	8.373242	8.373776	8.374310	8.374843	38
22	377499	378028	378557	379084	379612	380138	37
23	382762	383285	383807	384329	384850	385370	36
24	387962	388479	388995	389510	390025	390539	35
25	393101	393611	394121	394631	395139	395647	34
26	398179	398684	399188	399691	400194	400696	33
27	403199	403698	404196	404694	405191	405687	32
28	408161	408654	409147	409639	410130	410621	31
29	413068	413555	414042	414529	415015	415500	30
30	417919	418401	418883	419364	419844	420324	89 29
	'0	'9	'8	'7	'6	'5	

Log. Cosines.

TABLE IV.—LOGARITHMIC SINES.

	·6	·7	·8	·9	1·0	
0 1	8·122678	8·123629	8·124579	8·125526	8·126471	89 14
0 45	132099	133030	133959	134885	135810	13
47	141319	142231	143140	144048	144953	12
48	150348	151241	152131	153020	153907	11
49	159193	160067	160940	161811	162681	10
50	167861	168718	169574	170428	171280	9
51	176359	177200	178039	178877	179713	8
52	184695	185520	186343	187165	187985	7
53	192873	193683	194491	195297	196102	89 6
0 54	8·200900	8·201695	8·202488	8·203280	8·204070	5
55	208782	209562	210341	211119	211895	4
56	216523	217289	218055	218819	219581	3
57	224128	224881	225634	226384	227133	2
58	231603	232343	233082	233820	234557	1
59	238951	239679	240405	241131	241855	89 0
1 0	246176	246892	247607	248321	249033	59
1 1	253284	253988	254691	255393	256094	58
2	260276	260970	261662	262352	263042	88 57
1 3	8·267158	8·267841	8·268522	8·269202	8·269881	56
4	273933	274605	275275	275945	276614	55
5	280604	281265	281925	282585	283243	54
6	287173	287825	288475	289125	289773	53
7	293645	294287	294928	295568	296207	52
8	300021	300654	301286	301916	302546	51
9	306306	306929	307552	308173	308794	50
10	312500	313115	313729	314342	314954	49
11	318608	319214	319819	320423	321027	88 48
1 12	8·324630	8·325228	8·325825	8·326421	8·327016	47
13	330571	331160	331749	332337	332924	46
14	336431	337012	337593	338174	338753	45
15	342213	342787	343360	343933	344504	44
16	347919	348485	349051	349616	350180	43
17	353551	354110	354669	355226	355783	42
18	359111	359663	360214	360765	361315	41
19	364600	365145	365690	366234	366777	40
20	370021	370560	371095	371635	372171	88 39
1 21	8·375375	8·375907	8·376438	8·376969	8·377499	38
22	380664	381190	381714	382239	382762	37
23	385889	386409	386927	387445	387962	36
24	391053	391566	392078	392590	393101	35
25	396155	396662	397168	397674	398179	34
26	401198	401699	402200	402700	403199	33
27	406183	406679	407173	407668	408161	32
28	411112	411601	412091	412579	413068	31
29	415985	416469	416953	417436	417919	30
30	420804	421283	422762	422239	422717	88 29
	·4	·3	·2	·1	·0	

Log. Cosines.

1½ Deg.

TABLE V.—LOG. SINES, ETC.

2½ Deg.

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	8'		11'	8'		11'	10'00		9'99	
1 30	417919		582531	418068		581932	0149	6	9851	30
31	422717	7996	577283	422869	8002	577131	0152	6	9848	29
32	427462	7909	572538	427618	7914	572382	0156	6	9844	28
33	432156	7823	567844	432315	7828	567685	0159	6	9841	27
34	436800	7740	563200	436962	7745	563038	0162	6	9838	26
35	441394	7657	558606	441560	7663	558440	0166	6	9834	25
36	445941	7577	554059	446110	7583	553890	0169	6	9831	24
37	450440	7499	549560	450613	7505	549387	0173	6	9827	23
38	454893	7422	545107	455070	7428	544930	0177	6	9823	22
1 39	459301	7346	540699	459481	7352	540519	0180	6	9820	21
40	463665	7273	536335	463849	7279	536151	0184	6	9816	20
41	467985	7200	532015	468172	7206	531828	0188	6	9812	19
42	472263	7129	527737	472454	7135	527546	0191	6	9809	18
43	476498	7060	523502	476693	7066	523307	0195	6	9805	17
44	480693	6991	519307	480892	6998	519108	0199	6	9801	16
45	484848	6924	515152	485050	6931	514950	0203	7	9797	15
46	488963	6859	511037	489170	6865	510830	0207	7	9793	14
47	493040	6794	506960	493250	6801	506750	0210	7	9790	13
1 48	497078	6731	502922	497293	6738	502707	0214	7	9786	12
49	501080	6669	498920	501298	6676	498702	0218	7	9782	11
50	505045	6608	494955	505267	6615	494733	0222	7	9778	10
51	508974	6548	491026	509200	6555	490800	0226	7	9774	9
52	512867	6489	487133	513098	6496	486902	0231	7	9769	8
53	516726	6432	483274	516961	6439	483039	0235	7	9765	7
54	520551	6375	479449	520790	6382	479210	0239	7	9761	6
55	524343	6319	475657	524586	6326	475414	0243	7	9757	5
56	528102	6264	471898	528349	6272	471651	0247	7	9753	4
1 57	531828	6211	468172	532080	6218	467920	0252	7	9748	3
58	535523	6158	464477	535779	6165	464221	0256	7	9744	2
59	539186	6106	460814	539447	6113	460553	0260	7	9740	1
2 0	542819	6055	457181	543084	6062	456916	0265	7	9735	0
1	546422	6004	453578	546691	6012	453309	0269	7	9731	88
2	549995	5955	450005	550268	5962	449732	0274	7	9726	59
3	553539	5906	446461	553817	5914	446183	0278	8	9722	58
4	557054	5858	442946	557336	5866	442664	0283	8	9717	57
5	560540	5811	439460	560828	5819	439172	0287	8	9713	56
2 6	563999	5765	436001	564291	5773	435709	0292	8	9708	87
7	567431	5719	432569	567727	5727	432273	0296	8	9704	54
8	570836	5674	429164	571137	5682	428863	0301	8	9699	53
9	574214	5630	425786	574520	5638	425480	0306	8	9694	52
10	577566	5587	422434	577877	5595	422123	0311	8	9689	51
11	580892	5544	419108	581208	5552	418792	0315	8	9685	50
12	584193	5502	415807	584514	5510	415486	0320	8	9680	49
13	587469	5460	412531	587795	5468	412205	0325	8	9675	48
14	590721	5419	409279	591051	4427	408949	0330	8	9670	47
15	593948	5379	406052	594283	5387	405717	0335	8	9665	46
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec	D.	Sine	°

88½ Deg.

87½ Deg.

1° Deg.		TABLE V.—LOG. SINES, ETC.										3° Deg.	
	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.				
	8°		11°	8°		11°	10°00		9°99				
15	593948	5339	406052	594283	5347	405717	0335	8	9665			45	
16	597152	5300	402848	597492	5308	402508	0340	8	9660			44	
17	600332	5261	399668	600677	5270	399323	0345	8	9655			43	
18	603489	5223	396511	603839	5232	396161	0350	8	9650			42	
19	606623	5186	393377	606978	5194	393022	0355	8	9645			41	
20	609734	5149	390266	610094	5158	389906	0360	9	9640			40	
21	612823	5112	387177	613189	5121	386811	0365	9	9635			39	
22	615891	5076	384109	616262	5085	383738	0371	9	9629			38	
23	618937	5041	381063	619313	5050	380687	0376	9	9624	87		37	
24	621962	5006	378038	622343	5015	377657	0381	9	9619			36	
25	624965	4972	375035	625352	4981	374648	0386	9	9614			35	
26	627948	4938	372052	628340	4947	371660	0392	9	9608			34	
27	630911	4904	369089	631308	4913	368692	0397	9	9603			33	
28	633854	4871	366146	634256	4880	365744	0403	9	9597			32	
29	636776	4839	363224	637184	4848	362816	0408	9	9592			31	
30	639680	4806	360320	640093	4816	359907	0414	9	9586			30	
31	642563	4775	357437	642982	4784	357018	0419	9	9581			29	
32	645428	4743	354572	645853	4753	354147	0425	9	9575	87		28	
33	648274	4712	351726	648704	4722	351296	0430	9	9570			27	
34	651102	4682	348898	651537	4691	348463	0436	9	9564			26	
35	653911	4652	346089	654352	4661	345648	0442	10	9558			25	
36	656702	4622	343298	657149	4631	342851	0447	10	9553			24	
37	659475	4592	340525	659928	4602	340072	0453	10	9547			23	
38	662230	4563	337770	662689	4573	337311	0459	10	9541			22	
39	664968	4535	335032	665433	4544	334567	0465	10	9535			21	
40	667689	4506	332311	668160	4517	331840	0471	10	9529			20	
41	670393	4479	329607	670870	4488	329130	0476	10	9524	87		19	
42	673080	4451	326920	673563	4461	326437	0482	10	9518			18	
43	675751	4424	324249	676239	4434	323761	0488	10	9512			17	
44	678405	4397	321595	678900	4407	321100	0494	10	9506			16	
45	681043	4370	318957	681544	4380	318456	0500	10	9500			15	
46	683665	4344	316335	684172	4354	315828	0507	10	9493			14	
47	686272	4318	313728	686784	4328	313216	0513	10	9487			13	
48	688863	4292	311137	689381	4303	310619	0519	10	9481			12	
49	691438	4267	308562	691963	4277	308037	0525	10	9475			11	
50	693998	4242	306002	694529	4252	305471	0531	10	9469	87		10	
51	696543	4217	303457	697081	4228	302919	0537	11	9463			9	
52	699073	4192	300927	699617	4203	300383	0544	11	9456			8	
53	701589	4168	298411	702139	4179	297861	0550	11	9450			7	
54	704090	4144	295910	704646	4155	295354	0557	11	9443			6	
55	706577	4121	293423	707140	4132	292860	0563	11	9437			5	
56	709049	4097	290951	709618	4108	290382	0569	11	9431			4	
57	711507	4074	288493	712083	4085	287917	0576	11	9424			3	
58	713952	4051	286048	714534	4062	285466	0582	11	9418			2	
59	716383	4029	283617	716972	4040	283028	0589	11	9411			1	
60	718800		281200	719396		280604	0596		9404	87		0	
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine				

4½ Deg.

TABLE V.—LOG. SINES, ETC.

5¼ Deg.

°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		8°		11°	8°		11°	10°00		9°99	
4	30	894643	2670	105357	895984	2687	104016	1341	17	8659	
	31	896246	2660	103754	897596	2677	102404	1351	17	8649	
	32	897842	2651	102158	899203	2667	100797	1361	17	8639	
	33	899432	2641	100568	900803	2658	999197	1371	17	8629	
	34	901017	2631	998983	902398	2648	997602	1381	17	8619	
	35	902596	2622	997404	903987	2638	996013	1391	17	8609	
	36	904169	2612	995831	905570	2629	994430	1401	17	8599	
	37	905736	2603	994264	907147	2620	992853	1411	17	8589	
	38	907297	2593	992703	908719	2610	991281	1422	17	8578	85
4	39	908853	2584	991147	910285	2601	989715	1432	17	8568	
	40	910404	2575	989596	911846	2592	988154	1442	17	8558	
	41	911949	2566	988051	913401	2583	986599	1452	17	8548	
	42	913488	2556	986512	914951	2574	985049	1463	17	8537	
	43	915022	2547	984978	916495	2565	983505	1473	17	8527	
	44	916550	2538	983450	918034	2556	981966	1484	18	8516	
	45	918073	2529	981927	919568	2547	980432	1494	18	8506	
	46	919591	2520	980409	921096	2538	978904	1505	18	8495	
	47	921103	2512	978897	922619	2530	977381	1515	18	8485	85
4	48	922610	2503	977390	924136	2521	975864	1526	18	8474	
	49	924112	2494	975888	925649	2512	974351	1536	18	8464	
	50	925609	2486	974391	927156	2503	972844	1547	18	8453	
	51	927100	2477	972900	928658	2495	971342	1558	18	8442	
	52	928587	2469	971413	930155	2486	969845	1569	18	8431	
	53	930068	2460	969932	931647	2478	968353	1579	18	8421	
	54	931544	2452	968456	933134	2470	966866	1590	18	8410	
	55	933015	2443	966985	934616	2461	965384	1601	18	8399	
	56	934481	2435	965519	936093	2453	963907	1612	18	8388	85
4	57	935942	2427	964058	937565	2445	962435	1623	18	8377	
	58	937398	2419	962602	939032	2437	960968	1634	18	8366	
	59	938850	2411	961150	940494	2430	959506	1645	18	8355	
5	0	940296	2403	959704	941952	2421	958048	1656	18	8344	8
	1	941738	2394	958262	943404	2413	956596	1667	19	8333	
	2	943174	2387	956826	944852	2405	955148	1678	19	8322	
	3	944606	2379	955394	946295	2397	953705	1689	19	8311	
	4	946034	2371	953966	947734	2390	952266	1700	19	8300	
	5	947456	2363	952544	949168	2382	950832	1711	19	8289	84
5	6	948874	2355	951126	950597	2374	949403	1723	19	8277	
	7	950287	2348	949713	952021	2366	947979	1734	19	8266	
	8	951696	2340	948304	953441	2358	946559	1745	19	8255	
	9	953100	2332	946900	954856	2351	945144	1757	19	8243	
	10	954499	2325	945501	956267	2344	943733	1768	19	8232	
	11	955894	2317	944106	957674	2335	942326	1780	19	8220	
	12	957284	2310	942716	959075	2329	940925	1791	19	8209	
	13	958670	2302	941330	960473	2321	939527	1803	19	8197	
	14	960052	2295	939948	961866	2314	938134	1814	19	8186	
	15	961429		938571	963255		936745	1826	19	8174	84
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

85½ Deg.

84½ Deg.

TABLE V.—LOG. SINES, ETC.

0 Deg.

	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		11°	8°		11°	10°00		9°99	
29	2288	038571	963255	2307	036745	1826	19	8174	45
01	2280	037199	964639	2300	035361	1837	19	8163	44
70	2273	035830	966019	2293	033981	1849	19	8151	43
534	2266	034466	967394	2286	032606	1861	20	8139	42
893	2259	033107	968766	2279	031234	1872	20	8128	41
249	2252	031751	970133	2271	029867	1884	20	8116	40
600	2245	030400	971496	2265	028504	1896	20	8104	39
947	2238	029053	972855	2257	027145	1908	20	8092	38
2229	2231	027711	974209	2251	025791	1920	20	8080	84 37
3628	2224	026372	975560	2244	024440	1932	20	8068	36
4962	2217	025038	976906	2237	023094	1944	20	8056	35
6293	2210	023707	978248	2230	021752	1956	20	8044	34
7761	2203	022381	979586	2223	020414	1968	20	8032	33
78941	2197	021059	980921	2217	019079	1980	20	8020	32
80259	2190	019741	982251	2210	017749	1992	20	8008	31
81573	2183	018427	983577	2204	016423	2004	20	7996	30
982883	2177	017117	984899	2197	015101	2016	20	7984	29
984189	2170	015811	986217	2191	013783	2028	20	7972	84 28
985491	2163	014509	987532	2184	012468	2041	20	7959	27
986789	2157	013211	988842	2178	011158	2053	20	7947	26
988083	2150	011917	990149	2171	009851	2065	21	7931	25
989374	2144	010626	991451	2165	008549	2078	21	7921	24
990660	2138	009340	992750	2158	007250	2090	21	7911	23
991943	2131	008057	994045	2152	005955	2103	21	7897	22
993222	2125	006778	995337	2146	004663	2115	21	7885	21
994497	2119	005503	996624	2140	003376	2128	21	7872	20
995768	2112	004232	997908	2134	002092	2140	21	7860	84 19
997036	2106	002964	999188	2127	000812	2153	21	7847	18
998299	2100	001701	000465	2121	999535	2165	21	7835	17
999560	2094	000440	001738	2115	998262	2178	21	7822	16
000816	2088	999184	003007	2109	996993	2191	21	7809	15
002069	2082	997931	004272	2103	995728	2203	21	7797	14
003318	2076	996682	005534	2097	994466	2216	21	7784	13
004563	2070	995437	006792	2091	993208	2229	21	7771	12
005805	2064	994195	008047	2085	991953	2242	21	7758	11
007044	2058	992956	009298	2080	990702	2255	21	7745	84 10
008278	2052	991722	010546	2074	989454	2268	21	7732	9
009510	2046	990490	011790	2068	988210	2281	21	7719	8
010737	2040	989263	013031	2062	986969	2294	21	7706	7
011962	2034	988038	014268	2056	985732	2307	22	7693	6
013182	2029	986818	015502	2051	984498	2320	22	7680	5
014400	2023	985600	016732	2045	983268	2333	22	7667	4
015613	2017	984387	017959	2040	982041	2346	22	7654	3
016824	2012	983176	019183	2033	980817	2359	22	7641	2
018031	2006	981969	020403	2028	979597	2372	22	7628	1
019235		980765	021620		978380	2386	22	7614	84 0
	Cor.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine

1 Deg.

84 Deg.

7½ Deg.

TABLE V.—LOG. SINES, ETC.

8¼ De

°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'00		9'99	
7	30	115698		884302	119429	1625	880571	3731	28	6269	
	31	116656	1597	883344	120404	1622	879596	3748	28	6252	
	32	117613	1594	882387	121377	1618	878623	3765	28	6235	
	33	118567	1590	881433	122348	1615	877652	3781	28	6219	
	34	119519	1587	880481	123317	1611	876683	3798	28	6202	
	35	120469	1583	879531	124284	1608	875716	3815	28	6185	
	36	121417	1580	878583	125249	1604	874751	3832	28	6168	
	37	122362	1576	877638	126211	1601	873789	3849	28	6151	
	38	123306	1573	876694	127172	1597	872828	3866	28	6134	82
			1569								
7	39	124248	1566	875752	128130	1594	871870	3883	28	6117	
	40	125187	1562	874813	129087	1591	870913	3900	28	6100	
	41	126125	1559	873875	130041	1587	869959	3917	28	6083	
	42	127060	1556	872940	130994	1584	869006	3934	29	6066	
	43	127993	1552	872007	131944	1581	868056	3951	29	6049	
	44	128925	1549	871075	132893	1577	867107	3968	29	6032	
	45	129854	1545	870146	133839	1574	866161	3985	29	6015	
	46	130781	1542	869219	134784	1571	865216	4002	29	5998	
	47	131706	1539	868294	135726	1567	864274	4020	29	5980	82
7	48	132630	1535	867370	136667	1564	863333	4037	29	5963	
	49	133551	1532	866449	137605	1561	862395	4054	29	5946	
	50	134470	1529	865530	138542	1558	861458	4072	29	5928	
	51	135387	1525	864613	139476	1555	860524	4089	29	5911	
	52	136303	1522	863697	140409	1551	859591	4106	29	5894	
	53	137216	1519	862784	141340	1548	858660	4124	29	5876	
	54	138128	1516	861872	142269	1545	857731	4141	29	5859	
	55	139037	1512	860963	143196	1542	856804	4159	29	5841	
	56	139944	1509	860056	144121	1539	855879	4177	29	5823	82
7	57	140850	1506	859150	145044	1535	854956	4194	29	5806	
	58	141754	1503	858246	145966	1532	854034	4212	29	5788	
	59	142655	1500	857345	146885	1529	853115	4229	29	5771	82
8	0	143555	1496	856445	147803	1526	852197	4247	30	5753	
	1	144453	1493	855547	148718	1523	851282	4265	30	5735	
	2	145349	1490	854651	149632	1520	850368	4283	30	5717	
	3	146243	1487	853757	150544	1517	849456	4301	30	5699	
	4	147136	1484	852864	151454	1514	848546	4319	30	5681	
	5	148026	1481	851974	152363	1511	847637	4336	30	5664	81
8	6	148915	1478	851085	153269	1508	846731	4354	30	5646	
	7	149802	1475	850198	154174	1505	845826	4372	30	5628	
	8	150686	1472	849314	155077	1502	844923	4390	30	5610	
	9	151569	1469	848431	155978	1499	844022	4409	30	5591	
	10	152451	1466	847549	156877	1496	843123	4427	30	5573	
	11	153330	1463	846670	157775	1493	842225	4445	30	5555	
	12	154208	1460	845792	158671	1490	841329	4463	30	5537	
	13	155083	1457	844917	159565	1487	840435	4481	30	5519	
	14	155957	1454	844043	160457	1484	839543	4499	31	5501	
	15	156830		843170	161347		838653	4518	31	5482	81
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec	D.	Sine	

82½ Deg.

81¼ De

TABLE V.—LOG SINES, ETC.

81 Deg.		TABLE V.—LOG SINES, ETC.										9 Deg.	
	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Coa.				
	9'		10'	9'		10'	10'00		9'99				
15	156830	1451	843170	161347	1481	818653	4518		5432			45	
16	157700	1448	842300	162236	1479	837764	4536	31	5464			44	
17	158569	1445	841431	163123	1476	836877	4554	31	5446			43	
18	159435	1442	840565	164008	1473	835992	4573	31	5427			42	
19	160301	1439	839699	164892	1470	835108	4591	31	5409			41	
20	161164	1436	838836	165774	1467	834226	4610	31	5390			40	
21	162025	1433	837975	166654	1464	833346	4628	31	5372			39	
22	162885	1430	837115	167532	1461	832468	4647	31	5353			38	
23	163743	1427	836257	168409	1458	831591	4666	31	5334	81		37	
24	164600	1424	835400	169284	1455	830716	4684	31	5316			36	
25	165454	1422	834546	170157	1453	829843	4703	31	5297			35	
26	166307	1419	833693	171029	1450	828971	4722	31	5278			34	
27	167159	1416	832841	171899	1447	828101	4740	31	5260			33	
28	168008	1413	831992	172767	1444	827233	4759	31	5241			32	
29	168856	1410	831144	173634	1442	826366	4778	32	5222			31	
30	169702	1407	830298	174499	1439	825501	4797	32	5203			30	
31	170547	1405	829453	175362	1436	824638	4816	32	5184			29	
32	171389	1402	828611	176224	1433	823776	4835	32	5165	81		28	
33	172230	1399	827770	177084	1431	822916	4854	32	5146			27	
34	173070	1396	826930	177942	1428	822058	4873	32	5127			26	
35	173908	1394	826092	178799	1425	821201	4892	32	5108			25	
36	174744	1391	825256	179655	1423	820345	4911	32	5089			24	
37	175578	1388	824422	180508	1420	819492	4930	32	5070			23	
38	176411	1386	823589	181360	1417	818640	4949	32	5051			22	
39	177242	1383	822758	182211	1415	817789	4968	32	5032			21	
40	178072	1380	821928	183059	1412	816941	4987	32	5013			20	
41	178900	1377	821100	183907	1409	816093	5007	32	4993	81		19	
42	179726	1374	820274	184752	1407	815248	5026	32	4974			18	
43	180551	1372	819449	185597	1404	814403	5045	32	4955			17	
44	181374	1369	818626	186439	1402	813561	5065	32	4935			16	
45	182196	1366	817804	187280	1399	812720	5084	32	4916			15	
46	183016	1364	816984	188120	1396	811880	5104	33	4896			14	
47	183834	1361	816166	188958	1393	811042	5123	33	4877			13	
48	184651	1359	815349	189794	1391	810206	5143	33	4857			12	
49	185466	1356	814534	190629	1389	809371	5162	33	4838			11	
50	186280	1353	813720	191462	1386	808538	5182	33	4818	81		10	
51	187092	1351	812908	192294	1384	807706	5202	33	4798			9	
52	187903	1348	812097	193124	1381	806876	5221	33	4779			8	
53	188712	1346	811288	193953	1379	806047	5241	33	4759			7	
54	189519	1343	810481	194780	1376	805220	5261	33	4739			6	
55	190325	1341	809675	195606	1374	804394	5281	33	4719			5	
56	191130	1338	808870	196430	1371	803570	5300	33	4700			4	
57	191933	1336	808067	197253	1369	802747	5320	33	4680			3	
58	192734	1333	807266	198074	1366	801926	5340	33	4660			2	
59	193534	1330	806466	198894	1364	801106	5360	33	4640			1	
60	194332		805668	199713		800287	5380	33	4620	81		0	
	Coa.	D.	Sec.	Cot.	D.	Tang.	Cosec	D.	Sine				

81½ Deg.

81 Deg.

10½ Deg.

TABLE V.—LOG. SINES, ETC.

11¼ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'00		9'99	
10	30	260633	1135	739367	267967	1174	732033	7334	39	2666	30
	31	261314	1133	738686	268671	1172	731329	7357	39	2643	29
	32	261994	1131	738006	269375	1170	730625	7381	39	2619	28
	33	262673	1128	737327	270077	1169	729923	7404	39	2596	27
	34	263351	1126	736649	270779	1167	729221	7428	39	2572	26
	35	264027	1124	735973	271479	1165	728521	7451	39	2549	25
	36	264703	1122	735297	272178	1164	727822	7475	39	2525	24
	37	265377	1120	734623	272876	1162	727124	7499	39	2501	23
	38	266051	1118	733949	273573	1160	726427	7522	40	2478	22
10	39	266723	1119	733277	274269	1158	725731	7546	40	2454	21
	40	267395	1117	732605	274964	1157	725036	7570	40	2430	20
	41	268065	1115	731935	275658	1155	724342	7594	40	2406	19
	42	268734	1113	731266	276351	1153	723649	7618	40	2382	18
	43	269402	1111	730598	277043	1151	722957	7641	40	2359	17
	44	270069	1110	729931	277734	1150	722266	7665	40	2335	16
	45	270735	1108	729265	278424	1148	721576	7689	40	2311	15
	46	271400	1106	728600	279113	1147	720887	7713	40	2287	14
	47	272064	1105	727936	279801	1145	720199	7737	40	2263	13
10	48	272726	1103	727274	280488	1143	719512	7761	40	2239	12
	49	273388	1101	726612	281174	1141	718826	7786	40	2214	11
	50	274049	1099	725951	281858	1140	718142	7810	40	2190	10
	51	274708	1098	725292	282542	1138	717458	7834	40	2166	9
	52	275367	1096	724633	283225	1136	716775	7858	40	2142	8
	53	276024	1094	723976	283907	1135	716093	7883	41	2117	7
	54	276681	1092	723319	284588	1133	715412	7907	41	2093	6
	55	277337	1091	722663	285268	1131	714732	7931	41	2069	5
	56	277991	1089	722009	285947	1130	714053	7956	41	2044	4
10	57	278644	1087	721356	286624	1128	713376	7980	41	2020	3
	58	279297	1086	720703	287301	1126	712699	8004	41	1996	2
	59	279948	1084	720052	287977	1125	712023	8029	41	1971	1
11	0	280599	1082	719401	288652	1123	711348	8053	41	1947	79 0
	1	281248	1081	718752	289326	1122	710674	8078	41	1922	59
	2	281897	1079	718103	289999	1120	710001	8103	41	1897	58
	3	282544	1077	717456	290671	1118	709329	8127	41	1873	57
	4	283190	1076	716810	291342	1117	708658	8152	41	1848	56
	5	283836	1074	716164	292013	1115	707987	8177	41	1823	78 55
11	6	284480	1072	715520	292682	1114	707318	8201	41	1799	54
	7	285124	1071	714876	293350	1112	706650	8226	42	1774	53
	8	285766	1069	714234	294017	1111	705983	8251	42	1749	52
	9	286408	1067	713592	294684	1109	705316	8276	42	1724	51
	10	287048	1066	712952	295349	1107	704651	8301	42	1699	50
	11	287687	1064	712313	296012	1106	703987	8326	42	1674	49
	12	288326	1063	711674	296677	1104	703323	8351	42	1649	48
	13	288964	1061	711036	297339	1103	702661	8376	42	1624	47
	14	289600	1059	710400	298001	1101	701999	8401	42	1599	46
	15	290236		709764	298662		701338	8426	42	1574	78 45
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

79½ Deg.

78½ Deg.

11 $\frac{1}{2}$ Deg.		TABLE V.—LOG. SINES, ETC.								1 $\frac{1}{2}$ Deg.	
°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'00		9'99	
I	15	290236	1058	709764	298662	1100	701338	8426	42	1574	45
	16	290870	1056	709130	299322	1098	700678	8451	42	1549	44
	17	291504	1054	708496	299980	1096	700020	8476	42	1524	43
	18	292137	1053	707863	300638	1095	699362	8502	42	1498	42
	19	292768	1051	707232	301295	1093	698705	8527	42	1473	41
	20	293399	1050	706601	301951	1092	698049	8552	42	1448	40
	21	294029	1048	705971	302607	1090	697393	8578	42	1422	39
	22	294658	1046	705342	303261	1089	696739	8603	42	1397	38
	23	295286	1045	704714	303914	1087	696086	8628	43	1372	78 37
II	24	295913	1043	704087	304567	1086	695433	8654	43	1346	36
	25	296539	1042	703461	305218	1084	694782	8679	43	1321	35
	26	297164	1040	702836	305869	1083	694131	8705	43	1295	34
	27	297788	1039	702212	306519	1081	693481	8730	43	1270	33
	28	298412	1037	701588	307168	1080	692832	8756	43	1244	32
	29	299034	1036	700966	307815	1078	692185	8782	43	1218	31
	30	299655	1034	700345	308463	1077	691537	8807	43	1193	30
	31	300276	1032	699724	309109	1075	690891	8833	43	1167	29
	32	300895	1031	699105	309754	1074	690246	8859	43	1141	78 28
II	33	301514	1029	698486	310398	1073	689602	8885	43	1115	27
	34	302132	1028	697868	311042	1071	688958	8910	43	1090	26
	35	302748	1026	697252	311685	1070	688315	8936	43	1064	25
	36	303364	1025	696636	312327	1068	687673	8962	43	1038	24
	37	303979	1023	696021	312967	1067	687033	8988	43	1012	23
	38	304593	1022	695407	313608	1065	686392	9014	43	986	22
	39	305207	1020	694793	314247	1064	685753	9040	43	960	21
	40	305819	1019	694181	314885	1062	685115	9066	43	934	20
	41	306430	1017	693570	315523	1061	684477	9092	44	908	78 19
II	42	307041	1016	692959	316159	1060	683841	9118	44	882	18
	43	307650	1014	692350	316795	1058	683205	9145	44	855	17
	44	308259	1013	691741	317430	1057	682570	9171	44	829	16
	45	308867	1011	691133	318064	1055	681936	9197	44	803	15
	46	309474	1010	690526	318697	1054	681303	9223	44	777	14
	47	310080	1008	689920	319329	1053	680671	9250	44	750	13
	48	310685	1007	689315	319961	1051	680039	9276	44	724	12
	49	311289	1005	688711	320592	1050	679408	9303	44	697	11
	50	311893	1004	688107	321222	1048	678778	9329	44	671	78 10
II	51	312495	1003	687505	321851	1047	678149	9356	44	644	9
	52	313097	1001	686903	322479	1045	677521	9382	44	618	8
	53	313698	1000	686302	323106	1044	676894	9409	44	591	7
	54	314297	998	685703	323733	1043	676267	9435	44	565	6
	55	314897	997	685103	324358	1041	675642	9462	44	538	5
	56	315495	996	684505	324983	1040	675017	9489	45	511	4
	57	316092	994	683908	325607	1039	674393	9515	45	485	3
	58	316689	993	683311	326231	1037	673769	9542	45	458	2
	59	317284	991	682716	326853	1036	673147	9569	45	431	1
	60	317879		682121	327475		672525	9596	45	404	78 0
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

78 $\frac{1}{2}$ Deg.

78 Deg.

13½ Deg.

TABLE V.—LOG. SINES, ETC.

14½ Deg.

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.
	9'		10'	9'		10'	10'01		9'98
13	368185	876	631815	380354	927	619646	2168	51	7832
31	368711	875	631289	380910	926	619090	2199	51	7801
32	369236	874	630764	381466	925	618534	2229	51	7771
33	369761	873	630239	382020	924	617980	2260	51	7740
34	370285	872	629715	382575	923	617425	2290	51	7710
35	370808	871	629192	383129	922	616871	2321	51	7679
36	371330	870	628670	383682	921	616318	2351	51	7649
37	371852	869	628148	384234	920	615766	2382	51	7618
38	372373	867	627627	384786	919	615214	2412	51	7588
13	372894	866	627106	385337	918	614663	2443	51	7557
40	373414	865	626586	385888	917	614112	2474	51	7526
41	373933	864	626067	386438	916	613562	2504	51	7496
42	374452	863	625548	386987	915	613013	2535	51	7465
43	374970	862	625030	387536	914	612464	2566	51	7434
44	375487	861	624513	388084	913	611916	2597	51	7403
45	376003	860	623997	388631	912	611369	2628	52	7372
46	376519	859	623481	389178	911	610822	2659	52	7341
47	377035	858	622965	389724	910	610276	2690	52	7310
13	377549	857	622451	390270	909	609730	2721	52	7279
49	378063	856	621937	390815	908	609185	2752	52	7248
50	378577	855	621423	391360	907	608640	2783	52	7217
51	379089	854	620911	391903	906	608097	2814	52	7186
52	379601	853	620399	392447	905	607553	2845	52	7155
53	380113	852	619887	392989	904	607011	2876	52	7124
54	380624	851	619376	393531	903	606469	2908	52	7092
55	381134	850	618866	394073	902	605927	2939	52	7061
56	381643	848	618357	394614	901	605386	2970	52	7030
13	382152	847	617848	395154	900	604846	3002	52	6998
58	382661	846	617339	395694	899	604306	3033	52	6967
59	383168	845	616832	396233	898	603767	3064	52	6936
14	383675	844	616325	396771	897	603229	3096	52	6904
1	384182	843	615818	397309	896	602691	3127	52	6873
2	384687	842	615313	397846	895	602154	3159	53	6841
3	385192	841	614808	398383	894	601617	3191	53	6809
4	385697	840	614303	398919	893	601081	3222	53	6778
5	386201	839	613799	399455	892	600545	3254	53	6746
14	386704	838	613296	399990	891	600010	3286	53	6714
7	387207	837	612793	400524	890	599476	3317	53	6683
8	387709	836	612291	401058	889	598942	3349	53	6651
9	388210	835	611790	401591	888	598409	3381	53	6619
10	388711	834	611289	402124	887	597876	3413	53	6587
11	389211	833	610789	402656	886	597344	3445	53	6555
12	389711	832	610289	403187	885	596813	3477	53	6523
13	390210	831	609790	403718	884	596282	3509	53	6491
14	390708	830	609292	404249	883	595751	3541	53	6459
15	391206		608794	404778		595222	3573	53	6427
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine

76½ Deg.

75½ Deg.

14½ Deg.

TABLE V.—LOG. SINES, ETC.

15 Deg.

	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9'		10'	9'		10'	10'01		9'98	
14 15	391206	828	608794	404778	882	595222	3573		6427	45
16	391703	827	608297	405308	881	594692	3605	53	6395	44
17	392199	826	607801	405836	880	594164	3637	53	6363	43
18	392695	825	607305	406364	879	593636	3669	54	6331	42
19	393191	824	606809	406892	878	593108	3701	54	6299	41
20	393685	823	606315	407419	877	592581	3734	54	6266	40
21	394179	822	605821	407945	876	592055	3766	54	6234	39
22	394673	821	605327	408471	875	591529	3798	54	6202	38
23	395166	820	604834	408997	874	591003	3831	54	6169	75 37
14 24	395658	819	604342	409521	874	590479	3863		6137	36
25	396150	818	603850	410045	873	589955	3896	54	6104	35
26	396641	817	603359	410569	872	589431	3928	54	6072	34
27	397132	817	602868	411092	871	588908	3961	54	6039	33
28	397621	816	602379	411615	870	588385	3993	54	6007	32
29	398111	815	601889	412137	869	587863	4026	54	5974	31
30	398600	814	601400	412658	868	587342	4058	54	5942	30
31	399088	813	600912	413179	867	586821	4091	54	5909	29
32	399575	812	600425	413699	866	586301	4124	55	5876	75 28
14 33	400062	811	599938	414219	865	585781	4157		5843	27
34	400549	810	599451	414738	864	585262	4189	55	5811	26
35	401035	809	598965	415257	864	584743	4222	55	5778	25
36	401520	808	598480	415775	863	584225	4255	55	5745	24
37	402005	807	597995	416293	862	583707	4288	55	5712	23
38	402489	806	597511	416810	861	583190	4321	55	5679	22
39	402972	805	597028	417326	860	582674	4354	55	5646	21
40	403455	804	596545	417842	859	582158	4387	55	5613	20
41	403938	803	596062	418358	858	581642	4420	55	5580	75 19
14 42	404420	802	595580	418873	857	581127	4453		5547	18
43	404901	801	595099	419387	856	580613	4486	55	5514	17
44	405382	800	594618	419901	855	580099	4520	55	5480	16
45	405862	799	594138	420415	855	579585	4553	55	5447	15
46	406341	798	593659	420927	854	579073	4586	55	5414	14
47	406820	797	593180	421440	853	578560	4620	56	5380	13
48	407299	796	592701	421952	852	578048	4653	56	5347	12
49	407777	795	592223	422463	851	577537	4686	56	5314	11
50	408254	794	591746	422974	850	577026	4720	56	5280	75 10
14 51	408731	794	591269	423484	849	576516	4753		5247	9
52	409207	793	590793	423993	848	576007	4787	56	5213	8
53	409682	792	590318	424503	848	575497	4820	56	5180	7
54	410157	791	589843	425011	847	574989	4854	56	5146	6
55	410632	790	589368	425519	846	574481	4887	56	5113	5
56	411106	789	588894	426027	845	573973	4921	56	5079	4
57	411579	788	588421	426534	844	573466	4955	56	5045	3
58	412052	787	587948	427041	843	572959	4989	56	5011	2
59	412524	786	587476	427547	843	572453	5022	56	4978	1
60	412996		587004	428052		571948	5056	56	4944	75 0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

75½ Deg.

75 Deg.

15 Deg.

TABLE V.—LOG. SINES, ETC.

15 $\frac{1}{2}$ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'01		9'98	
15	0	412996	785	587004	428052	842	571948	5056		4944	
	1	413467	784	586533	428557	841	571443	5090	57	4910	
	2	413938	783	586062	429062	840	570938	5124	57	4876	
	3	414408	783	585592	429566	839	570434	5158	57	4842	
	4	414878	782	585122	430070	838	569930	5192	57	4808	
	5	415347	781	584653	430573	838	569427	5226	57	4774	
	6	415815	780	584185	431075	837	568925	5260	57	4740	
	7	416283	779	583717	431577	836	568423	5294	57	4706	
	8	416751	778	583249	432079	835	567921	5328	57	4672	74
15	9	417217	777	582783	432580	834	567420	5363	57	4637	
	10	417684	776	582316	433080	833	566920	5397	57	4603	
	11	418150	775	581850	433580	832	566420	5431	57	4569	
	12	418615	774	581385	434080	832	565920	5465	57	4535	
	13	419079	773	580921	434579	831	565421	5500	57	4500	
	14	419544	773	580456	435078	830	564922	5534	57	4466	
	15	420007	772	579993	435576	829	564424	5568	58	4432	
	16	420470	771	579530	436073	828	563927	5603	58	4397	
	17	420933	770	579067	436570	828	563430	5637	58	4363	74
15	18	421395	769	578605	437067	827	562933	5672	58	4328	
	19	421857	768	578143	437563	826	562437	5706	58	4294	
	20	422318	767	577682	438059	825	561941	5741	58	4259	
	21	422778	767	577222	438554	824	561446	5776	58	4224	
	22	423238	766	576762	439048	823	560952	5810	58	4190	
	23	423697	765	576303	439543	823	560457	5845	58	4155	
	24	424156	764	575844	440036	822	559964	5880	58	4120	
	25	424615	763	575385	440529	821	559471	5915	58	4085	
	26	425073	762	574927	441022	820	558978	5950	58	4050	74
15	27	425530	761	574470	441514	819	558486	5985	58	4015	
	28	425987	760	574013	442006	819	557994	6019	58	3981	
	29	426443	760	573557	442497	818	557503	6054	58	3946	
	30	426899	759	573101	442988	817	557012	6089	58	3911	
	31	427354	758	572646	443479	816	556521	6125	58	3875	
	32	427809	757	572191	443968	816	556032	6160	58	3840	
	33	428263	756	571737	444458	815	555542	6195	59	3805	
	34	428717	755	571283	444947	814	555053	6230	59	3770	
	35	429170	754	570830	445435	813	554565	6265	59	3735	74
15	36	429623	753	570377	445923	812	554077	6300	59	3700	
	37	430075	752	569925	446411	812	553589	6336	59	3664	
	38	430527	752	569473	446898	811	553102	6371	59	3629	
	39	430978	751	569022	447384	810	552616	6406	59	3594	
	40	431429	750	568571	447870	809	552130	6442	59	3558	
	41	431879	749	568121	448356	809	551644	6477	59	3523	
	42	432329	749	567671	448841	808	551159	6513	59	3487	
	43	432778	748	567222	449326	807	550674	6548	59	3452	
	44	433226	747	566774	449810	806	550190	6584	59	3416	
	45	433675	747	566325	450294	806	549706	6619	59	3381	74
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

75 Deg.

74 $\frac{1}{2}$

15½ Deg.		TABLE V.—LOG. SINES, ETC.								16½ Deg.	
°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'01		9'98	
15	45	433675	746	566325	450294	806	549706	6619		3381	15
	46	434122	745	565878	450777	805	549223	6655	59	3345	14
	47	434569	744	565431	451260	804	548740	6691	59	3309	13
	48	435016	744	564984	451743	803	548257	6727	59	3273	12
	49	435462	743	564538	452225	802	547775	6762	60	3238	11
	50	435908	742	564092	452706	802	547294	6798	60	3202	10
	51	436353	741	563647	453187	801	546813	6834	60	3166	9
	52	436798	740	563202	453668	800	546332	6870	60	3130	8
	53	437242	740	562758	454148	799	545852	6906	60	3094	7
15	54	437686	739	562314	454628	799	545372	6942	60	3058	6
	55	438129	738	561871	455107	798	544893	6978	60	3022	5
	56	438572	737	561428	455586	797	544414	7014	60	2986	4
	57	439014	736	560986	456064	796	543936	7050	60	2950	3
	58	439456	735	560544	456542	796	543458	7086	60	2914	2
	59	439897	735	560103	457019	795	542981	7122	60	2878	1
16	0	440338	734	559662	457496	794	542504	7158	60	2842	74 c
	1	440778	733	559222	457973	793	542027	7195	60	2805	59
	2	441218	732	558782	458449	793	541551	7231	61	2769	73 58
16	3	441658	731	558342	458925	792	541075	7267	61	2733	57
	4	442096	730	557900	459400	791	540600	7304	61	2696	56
	5	442535	730	557465	459875	790	540125	7340	61	2660	55
	6	442973	729	557027	460349	790	539651	7376	61	2624	54
	7	443410	728	556590	460823	789	539177	7413	61	2587	53
	8	443847	727	556153	461297	788	538703	7449	61	2551	52
	9	444284	727	555716	461770	788	538230	7486	61	2514	51
	10	444720	726	555280	462242	787	537758	7523	61	2477	50
	11	445155	725	554845	462714	786	537286	7559	61	2441	73 49
16	12	445590	724	554410	463186	785	536814	7596	61	2404	48
	13	446025	723	553975	463658	785	536342	7633	61	2367	47
	14	446459	722	553541	464129	784	535871	7669	61	2331	46
	15	446893	722	553107	464599	783	535401	7706	61	2294	45
	16	447326	721	552674	465069	783	534931	7743	61	2257	44
	17	447759	720	552241	465539	782	534461	7780	62	2220	43
	18	448191	720	551809	466008	781	533992	7817	62	2183	42
	19	448623	719	551377	466476	780	533524	7854	62	2146	41
	20	449054	718	550946	466945	780	533055	7891	62	2109	73 40
16	21	449485	717	550515	467413	779	532587	7928	62	2072	39
	22	449915	716	550085	467880	778	532120	7965	62	2035	38
	23	450345	716	549655	468347	778	531653	8002	62	1998	37
	24	450775	715	549225	468814	777	531186	8039	62	1961	36
	25	451204	714	548796	469280	776	530720	8076	62	1924	35
	26	451632	713	548368	469746	775	530254	8114	62	1886	34
	27	452060	713	547940	470211	775	529789	8151	62	1849	33
	28	452488	712	547512	470676	774	529324	8188	62	1812	32
	29	452915	711	547085	471141	773	528859	8226	62	1774	31
	30	453342		546658	471605		528395	8263	62	1737	73 30
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

14½ Deg.

78½ De

16½ Deg.

TABLE V.—LOG. SINES, ETC.

17¼ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'01		9'98	
16	30	455342	710	546658	471605	773	528395	8263	62	1737	
	31	455768	710	546232	472068	772	527932	8301	63	1699	
	32	454194	709	545806	472532	771	527468	8338	63	1662	
	33	454619	708	545381	472995	771	527005	8375	63	1625	
	34	455044	707	544956	473457	770	526543	8413	63	1587	
	35	455469	707	544531	473919	769	526081	8451	63	1549	
	36	455893	706	544107	474381	769	525619	8488	63	1512	
	37	456316	705	543684	474842	768	525158	8526	63	1474	
	38	456739	704	543261	475303	767	524697	8564	63	1436	73
16	39	457162	704	542838	475763	767	524237	8601	63	1399	
	40	457584	703	542416	476223	766	523777	8639	63	1361	
	41	458006	702	541994	476683	765	523317	8677	63	1323	
	42	458427	701	541573	477142	765	522858	8715	63	1285	
	43	458848	701	541152	477601	764	522399	8753	63	1247	
	44	459268	700	540732	478059	763	521941	8791	63	1209	
	45	459688	699	540312	478517	763	521483	8829	63	1171	
	46	460108	698	539892	478975	762	521025	8867	63	1133	
	47	460527	698	539473	479432	761	520568	8905	64	1095	73
16	48	460946	697	539054	479889	761	520111	8943	64	1057	
	49	461364	696	538636	480345	760	519655	8981	64	1019	
	50	461782	695	538218	480801	759	519199	9019	64	981	
	51	462199	695	537801	481257	759	518743	9058	64	942	
	52	462616	694	537384	481712	758	518288	9096	64	904	
	53	463032	693	536968	482167	757	517833	9134	64	866	
	54	463448	693	536552	482621	757	517379	9173	64	827	
	55	463864	692	536136	483075	756	516925	9211	64	789	
	56	464279	691	535721	483529	755	516471	9250	64	750	73
16	57	464694	690	535306	483982	755	516018	9288	64	712	
	58	465108	690	534892	484435	754	515565	9327	64	673	
	59	465522	689	534478	484887	753	515113	9365	64	635	
17	0	465935	688	534065	485339	753	514661	9404	64	596	73
	1	466348	688	533652	485791	752	514209	9442	64	558	
	2	466761	687	533239	486242	751	513758	9481	65	519	
	3	467173	686	532827	486693	751	513307	9520	65	480	
	4	467585	685	532415	487143	750	512857	9558	65	442	
	5	467996	685	532004	487593	749	512407	9597	65	403	72
17	6	468407	684	531593	488043	749	511957	9636	65	364	
	7	468817	683	531183	488492	748	511508	9675	65	325	
	8	469227	683	530773	488941	747	511059	9714	65	286	
	9	469637	682	530363	489390	747	510610	9753	65	247	
	10	470046	681	529954	489838	746	510162	9792	65	208	
	11	470455	680	529545	490286	746	509714	9831	65	169	
	12	470863	680	529137	490733	745	509267	9870	65	130	
	13	471271	679	528729	491180	744	508820	9909	65	91	
	14	471679	678	528321	491627	744	508373	9948	65	52	
	15	472086		527914	492073		507927	9988	65	12	72
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec	D.	Sine	°

78½ Deg

72¾ Deg

17½ Deg.		TABLE V.—LOG SINES, ETC.										18 Deg.	
'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.				
	9'4		10'5	9'		10'	10'0		9'9				
17	15	72086	678	27914	492073	743	507927	19988	65	80012	45		
	16	72492	677	27508	492519	743	507481	20027	65	79973	44		
	17	72898	676	27102	492965	742	507035	20066	66	79934	43		
	18	73304	676	26696	493410	741	506590	20105	66	79895	42		
	19	73710	675	26290	493854	740	506146	20145	66	79855	41		
	20	74115	674	25885	494299	740	505701	20184	66	79816	40		
	21	74519	674	25481	494743	740	505257	20224	66	79776	39		
	22	74923	673	25077	495186	740	504814	20263	66	79737	38		
	23	75327	672	24673	495630	739	504370	20303	66	79697	72 37		
17	24	75730	672	24270	496073	737	503927	20342	66	79658	36		
	25	76133	671	23867	496515	737	503485	20382	66	79618	35		
	26	76536	670	23464	496957	736	503043	20421	66	79579	34		
	27	76939	669	23062	497399	736	502601	20461	66	79539	33		
	28	77340	669	22660	497841	735	502159	20501	66	79499	32		
	29	77741	668	22259	498282	735	501718	20541	66	79459	31		
	30	78142	667	21858	498722	734	501278	20580	66	79420	30		
	31	78542	667	21458	499163	733	500837	20620	66	79380	29		
	32	78942	666	21058	499603	733	500397	20660	66	79340	72 28		
17	33	79342	665	20658	500042	732	499958	20700	67	79300	27		
	34	79741	665	20259	500481	731	499519	20740	67	79260	26		
	35	80140	664	19860	500920	731	499080	20780	67	79220	25		
	36	80539	663	19461	501359	730	498641	20820	67	79180	24		
	37	80937	663	19063	501797	730	498203	20860	67	79140	23		
	38	81334	662	18666	502235	729	497765	20900	67	79100	22		
	39	81731	661	18269	502672	728	497328	20941	67	79059	21		
	40	82128	661	17872	503109	728	496891	20981	67	79019	20		
	41	82525	660	17475	503546	727	496454	21021	67	78979	72 19		
17	42	82921	659	17079	503982	727	496018	21061	67	78939	18		
	43	83316	659	16684	504418	726	495582	21102	67	78898	17		
	44	83712	658	16288	504854	725	495146	21142	67	78858	16		
	45	84107	657	15893	505289	725	494711	21183	67	78817	15		
	46	84501	657	15499	505724	724	494276	21223	67	78777	14		
	47	84895	656	15105	506159	724	493841	21264	67	78736	13		
	48	85289	655	14711	506593	723	493407	21304	68	78696	12		
	49	85682	655	14318	507027	722	492973	21345	68	78655	11		
	50	86075	654	13923	507460	722	492540	21385	68	78615	72 10		
17	51	86467	653	13533	507893	721	492107	21426	68	78574	9		
	52	86860	653	13140	508326	721	491674	21467	68	78533	8		
	53	87251	652	12749	508759	720	491241	21507	68	78493	7		
	54	87643	651	12357	509191	719	490809	21548	68	78452	6		
	55	88034	651	11966	509622	719	490378	21589	68	78411	5		
	56	88424	650	11576	510054	718	489946	21630	68	78370	4		
	57	88814	650	11186	510485	718	489515	21671	68	78329	3		
	58	89204	649	10796	510916	717	489084	21712	68	78288	2		
	59	89593	648	10407	511346	716	488654	21753	68	78247	1		
	60	89982		10018	511776		488224	21794		78206	72 0		
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine				

2½ Deg.

72 Deg.

19½ Deg.

TABLE V.—LOG. SINES, ETC.

20¼ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'02		9'97	
19	30	523495	595	476505	549149	669	450851	5653	75	4347	
	31	523852	594	476148	549550	668	450450	5698	75	4302	
	32	524208	594	475792	549951	668	450049	5743	75	4257	
	33	524564	593	475436	550352	667	449648	5788	75	4212	
	34	524920	593	475080	550752	667	449248	5833	75	4167	
	35	525275	592	474725	551152	666	448848	5878	75	4122	
	36	525630	591	474370	551552	666	448448	5923	75	4077	
	37	525984	591	474016	551952	665	448048	5968	75	4032	
	38	526339	590	473661	552351	665	447649	6013	75	3987	70
19	39	526693	590	473307	552750	665	447250	6058	75	3942	
	40	527046	589	472954	553149	664	446851	6103	75	3897	
	41	527400	589	472600	553548	664	446452	6148	75	3852	
	42	527753	588	472247	553946	663	446054	6193	75	3807	
	43	528105	588	471895	554344	663	445656	6239	75	3761	
	44	528458	587	471542	554741	662	445259	6284	75	3716	
	45	528810	587	471190	555139	662	444861	6329	76	3671	
	46	529161	586	470839	555536	661	444464	6375	76	3625	
	47	529513	586	470487	555933	661	444067	6420	76	3580	70
19	48	529864	585	470136	556329	660	443671	6465	76	3535	
	49	530215	585	469785	556725	660	443275	6511	76	3489	
	50	530565	584	469435	557121	659	442879	6556	76	3444	
	51	530915	584	469085	557517	659	442483	6602	76	3398	
	52	531265	583	468735	557913	659	442087	6648	76	3352	
	53	531614	582	468386	558308	658	441692	6693	76	3307	
	54	531963	582	468037	558702	658	441298	6739	76	3261	
	55	532312	581	467688	559097	657	440903	6785	76	3215	
	56	532661	581	467339	559491	657	440509	6831	76	3169	70
19	57	533009	580	466991	559885	656	440115	6876	76	3124	
	58	533357	580	466643	560279	656	439721	6922	76	3078	
	59	533704	579	466296	560673	655	439327	6968	76	3032	
20	0	534052	579	465948	561066	655	438934	7014	77	2986	70
	1	534399	578	465601	561459	654	438541	7060	77	2940	
	2	534745	577	465255	561851	654	438149	7106	77	2894	
	3	535092	577	464908	562244	653	437756	7152	77	2848	
	4	535438	576	464562	562636	653	437364	7198	77	2802	
	5	535783	576	464217	563028	653	436972	7245	77	2755	69
20	6	536129	575	463871	563419	652	436581	7291	77	2709	
	7	536474	574	463526	563811	652	436189	7337	77	2663	
	8	536818	574	463182	564202	651	435798	7383	77	2617	
	9	537163	573	462837	564592	651	435408	7430	77	2570	
	10	537507	573	462493	564983	650	435017	7476	77	2524	
	11	537851	572	462149	565373	650	434627	7522	77	2478	
	12	538194	572	461806	565763	649	434237	7569	78	2431	
	13	538538	571	461462	566153	649	433847	7615	78	2385	
	14	538880	571	461120	566542	649	433458	7662	78	2338	
	15	539223	571	460777	566932	649	433068	7709	78	2291	69
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

72½ Deg.

69¾ Deg.

TABLE V.—LOG. SINES, ETC.

10 $\frac{1}{2}$ Deg.		TABLE V.—LOG. SINES, ETC.										21 Deg.	
		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.			
		9'		10'	9'		10'	10'02		9'97			
10	15	539223		460777	566932	648	433068	7709	78	2291		45	
	16	539565	570	460435	567320	648	432680	7755	78	2245		44	
	17	539907	570	460093	567709	647	432291	7802	78	2198		43	
	18	540249	569	459751	568098	647	431902	7849	78	2151		42	
	19	540590	569	459410	568486	646	431514	7895	78	2105		41	
	20	540931	568	459069	568873	646	431127	7942	78	2058		40	
	21	541272	567	458728	569261	645	430739	7989	78	2011		39	
	22	541613	567	458387	569648	645	430352	8036	78	1964		38	
	23	541953	566	458047	570035	645	429965	8083	78	1917	69	37	
10	24	542293	566	457707	570422	644	429578	8130	78	1870		36	
	25	542632	565	457368	570809	644	429191	8177	78	1823		35	
	26	542971	565	457029	571195	643	428805	8224	78	1776		34	
	27	543310	564	456690	571581	643	428419	8271	79	1729		33	
	28	543649	564	456351	571967	642	428033	8318	79	1682		32	
	29	543987	563	456013	572352	642	427648	8365	79	1635		31	
	30	544325	563	455675	572738	642	427262	8412	79	1588		30	
	31	544663	562	455337	573123	641	426877	8460	79	1540		29	
	32	545000	562	455000	573507	641	426493	8507	79	1493	69	28	
10	33	545338	561	454662	573892	640	426108	8554	79	1446		27	
	34	545674	561	454326	574276	640	425724	8602	79	1398		26	
	35	546011	560	453989	574660	639	425340	8649	79	1351		25	
	36	546347	560	453653	575044	639	424956	8697	79	1303		24	
	37	546683	559	453317	575427	639	424573	8744	79	1256		23	
	38	547019	559	452981	575810	638	424190	8792	79	1208		22	
	39	547354	558	452646	576193	638	423807	8839	79	1161		21	
	40	547689	558	452311	576576	637	423424	8887	79	1113		20	
	41	548024	557	451976	576958	637	423042	8934	80	1066	69	19	
10	42	548359	557	451641	577341	636	422659	8982	80	1018		18	
	43	548693	556	451307	577723	636	422277	9030	80	0970		17	
	44	549027	556	450973	578104	636	421896	9078	80	0922		16	
	45	549360	555	450640	578486	635	421514	9126	80	0874		15	
	46	549693	555	450307	578867	635	421133	9173	80	0827		14	
	47	550026	554	449974	579248	634	420752	9221	80	0779		13	
	48	550359	554	449641	579629	634	420371	9269	80	0731		12	
	49	550692	553	449308	580009	634	419991	9317	80	0683		11	
	50	551024	553	448976	580389	633	419611	9365	80	0635	69	10	
10	51	551356	552	448644	580769	633	419231	9414	80	0586		9	
	52	551687	552	448313	581149	632	418851	9462	80	0538		8	
	53	552018	552	447982	581528	632	418472	9510	80	0490		7	
	54	552349	551	447651	581907	632	418093	9558	80	0442		6	
	55	552680	551	447320	582286	631	417714	9606	80	0394		5	
	56	553010	550	446990	582665	631	417335	9655	81	0345		4	
	57	553341	550	446659	583043	630	416957	9703	81	0297		3	
	58	553670	549	446330	583422	630	416578	9751	81	0249		2	
	59	554000	549	446000	583800	629	416200	9800	81	0200		1	
	60	554329	549	445671	584177	629	415823	9848	81	0152	69	0	
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine			

10 $\frac{1}{2}$ Deg.

60 Deg.

22½ Deg.

TABLE V.—LOG. SINES, ETC.

23½ D

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.
	2'		10'	2'		10'	10.03		9'96
22 30	582840	508	417160	617224	595	382776	4385	87	5615
31	583145	508	416855	617582	595	382418	4437	87	5563
32	583449	507	416551	617939	595	382061	4489	87	5511
33	583754	507	416246	618295	594	381705	4542	87	5458
34	584058	506	415942	618652	594	381348	4594	87	5406
35	584361	506	415639	619008	594	380992	4647	88	5353
36	584665	506	415335	619364	593	380636	4699	88	5301
37	584968	505	415032	619721	593	380279	4752	88	5248
38	585272	505	414728	620076	593	379924	4805	88	5195
22 39	585574	504	414426	620432	592	379568	4857	88	5143
40	585877	504	414123	620787	592	379213	4910	88	5090
41	586179	503	413821	621142	592	378858	4963	88	5037
42	586482	503	413518	621497	591	378503	5016	88	4984
43	586783	503	413217	621852	591	378148	5069	88	4931
44	587085	502	412915	622207	590	377793	5121	88	4879
45	587386	502	412614	622561	590	377439	5174	88	4826
46	587688	501	412312	622915	590	377085	5227	88	4773
47	587989	501	412011	623269	589	376731	5281	88	4719
22 48	588289	501	411711	623623	589	376377	5334	89	4666
49	588590	500	411410	623976	589	376024	5387	89	4613
50	588890	500	411110	624330	588	375670	5440	89	4560
51	589190	499	410810	624683	588	375317	5493	89	4507
52	589489	499	410511	625036	588	374964	5546	89	4454
53	589789	499	410211	625388	587	374612	5600	89	4400
54	590088	498	409912	625741	587	374259	5653	89	4347
55	590387	498	409613	626093	587	373907	5706	89	4294
56	590686	497	409314	626445	586	373555	5760	89	4240
22 57	590984	497	409016	626797	586	373203	5813	89	4187
58	591282	497	408718	627149	586	372851	5867	89	4133
59	591580	496	408420	627501	585	372499	5920	89	4080
23 0	591878	496	408122	627852	585	372148	5974	89	4026
1	592176	495	407824	628203	585	371797	6028	89	3972
2	592473	495	407527	628554	585	371446	6081	89	3919
3	592770	495	407230	628905	585	371095	6135	89	3865
4	593067	494	406933	629255	584	370745	6189	90	3811
5	593363	494	406637	629606	584	370394	6243	90	3757
23 6	593659	493	406341	629956	583	370044	6296	90	3704
7	593955	493	406045	630306	583	369694	6350	90	3650
8	594251	493	405749	630656	583	369344	6404	90	3596
9	594547	492	405453	631005	582	368995	6458	90	3542
10	594842	492	405158	631355	582	368645	6512	90	3488
11	595137	491	404863	631704	582	368296	6566	90	3434
12	595432	491	404568	632053	581	367947	6621	90	3379
13	595727	491	404273	632401	581	367599	6675	90	3325
14	596021	490	403979	632750	581	367250	6729	90	3271
15	596315	490	403685	633098	581	366902	6783	90	3217
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine

67½ Deg.

68½ D

23½ Deg.

TABLE V.—LOG. SINES, ETC.

24 Deg.

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9'		10'	9'		10'	10'03		9'96	
23 15	596315	490	403685	633098	580	366902	6783	90	3217	45
16	596609	489	403391	633447	580	366553	6837	90	3163	44
17	596903	489	403097	633795	580	366205	6892	91	3108	43
18	597196	489	402804	634143	579	365857	6946	91	3054	42
19	597490	488	402510	634490	579	365510	7001	91	2999	41
20	597783	488	402217	634838	579	365162	7055	91	2945	40
21	598075	487	401925	635185	578	364815	7110	91	2890	39
22	598368	487	401632	635532	578	364468	7164	91	2836	38
23	598660	487	401340	635879	578	364121	7219	91	2781	66 37
24	598952	486	401048	636226	577	363774	7273	91	2727	36
25	599244	486	400756	636572	577	363428	7328	91	2672	35
26	599536	485	400464	636919	577	363081	7383	91	2617	34
27	599827	485	400173	637265	577	362735	7438	91	2562	33
28	600118	485	399882	637611	577	362389	7492	91	2508	32
29	600409	484	399591	637956	576	362044	7547	91	2453	31
30	600700	484	399300	638302	576	361698	7602	91	2398	30
31	600990	484	399010	638647	575	361353	7657	92	2343	29
32	601280	483	398720	638992	575	361008	7712	92	2288	66 28
33	601570	483	398430	639337	575	360663	7767	92	2233	27
34	601860	482	398140	639682	574	360318	7822	92	2178	26
35	602150	482	397850	640027	574	359973	7877	92	2123	25
36	602439	482	397561	640371	574	359629	7933	92	2067	24
37	602728	481	397272	640716	573	359284	7988	92	2012	23
38	603017	481	396983	641060	573	358940	8043	92	1957	22
39	603305	481	396695	641404	573	358596	8098	92	1902	21
40	603594	480	396406	641747	572	358253	8154	92	1846	20
41	603882	480	396118	642091	572	357909	8209	92	1791	66 19
42	604170	479	395830	642434	572	357566	8265	92	1735	18
43	604457	479	395543	642777	572	357223	8320	92	1680	17
44	604745	479	395255	643120	571	356880	8376	92	1624	16
45	605032	478	394968	643463	571	356537	8431	93	1569	15
46	605319	478	394681	643806	571	356194	8487	93	1513	14
47	605606	478	394394	644148	570	355852	8542	93	1458	13
48	605892	477	394108	644490	570	355510	8598	93	1402	12
49	606179	477	393821	644832	570	355168	8654	93	1346	11
50	606465	476	393535	645174	569	354826	8710	93	1290	66 10
51	606751	476	393249	645516	569	354484	8765	93	1235	9
52	607036	476	392964	645857	569	354143	8821	93	1179	8
53	607322	475	392678	646199	569	353801	8877	93	1123	7
54	607607	475	392393	646540	568	353460	8933	93	1067	6
55	607892	475	392108	646881	568	353119	8989	93	1011	5
56	608177	474	391823	647222	568	352778	9045	93	955	4
57	608461	474	391539	647562	567	352438	9101	93	899	3
58	608745	473	391255	647903	567	352097	9157	93	843	2
59	609029	473	390971	648243	567	351757	9214	94	786	1
60	609313	473	390687	648583	567	351417	9270	94	730	66 0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

60½ Deg.

66 Deg.

24 Deg.

TABLE V.—LOG. SINES, ETC.

24½ De

°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Co.	
		9'6		10'3	9'		10'	10'0		9'9	
24	0	09313		90687	648583	566	351417	39270		60730	
	1	09597	473	90403	648923	566	351077	39326	94	60674	
	2	09880	472	90120	649263	566	350737	39382	94	60618	
	3	10164	472	89836	649602	566	350398	39439	94	60561	
	4	10447	472	89553	649942	565	350058	39495	94	60505	
	5	10729	471	89271	650281	565	349719	39552	94	60448	
	6	11012	471	88988	650620	565	349380	39608	94	60392	
	7	11294	470	88706	650959	565	349041	39665	94	60335	
	8	11576	470	88424	651297	564	348703	39721	94	60279	65
24	9	11858		88142	651636	564	348364	39778	94	60222	
	10	12140	469	87860	651974	563	348026	39835	94	60165	
	11	12421	469	87579	652312	563	347688	39891	94	60109	
	12	12702	468	87298	652650	563	347350	39948	95	60052	
	13	12983	468	87017	652988	563	347012	40005	95	59995	
	14	13264	467	86736	653326	562	346674	40062	95	59938	
	15	13545	467	86455	653663	562	346337	40118	95	59882	
	16	13825	467	86175	654000	562	346000	40175	95	59825	
	17	14105	466	85895	654337	561	345663	40232	95	59768	65
24	18	14385		85615	654674	561	345326	40289	95	59711	
	19	14665	466	85335	655011	561	344989	40346	95	59654	
	20	14944	465	85056	655348	561	344652	40404	95	59596	
	21	15223	465	84777	655684	560	344316	40461	95	59539	
	22	15502	465	84498	656020	560	343980	40518	95	59482	
	23	15781	464	84219	656356	560	343644	40575	95	59425	
	24	16060	464	83940	656692	559	343308	40632	95	59368	
	25	16338	464	83662	657028	559	342972	40690	96	59310	
	26	16616	463	83384	657364	559	342636	40747	96	59253	65
24	27	16894		83106	657699	559	342301	40805	96	59195	
	28	17172	463	82828	658034	558	341966	40862	96	59138	
	29	17450	462	82550	658369	558	341631	40919	96	59081	
	30	17727	462	82273	658704	558	341296	40977	96	59023	
	31	18004	461	81996	659039	558	340961	41035	96	58965	
	32	18281	461	81719	659373	557	340627	41092	96	58908	
	33	18558	461	81442	659708	557	340292	41150	96	58850	
	34	18834	460	81166	660042	557	339958	41208	96	58792	
	35	19110	460	80890	660376	557	339624	41266	96	58734	65
24	36	19386		80614	660710	556	339290	41323	96	58677	
	37	19662	459	80338	661043	556	338957	41381	96	58619	
	38	19938	459	80062	661377	556	338623	41439	96	58561	
	39	20213	459	79787	661710	555	338290	41497	97	58503	
	40	20488	458	79512	662043	555	337957	41555	97	58445	
	41	20763	458	79237	662376	555	337624	41613	97	58387	
	42	21038	457	78962	662709	554	337291	41671	97	58329	
	43	21313	457	78687	663042	554	336958	41729	97	58271	
	44	21587	457	78413	663375	554	336625	41787	97	58213	
	45	21861	457	78139	663707	554	336293	41846	97	58154	65
		Co.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

66 Deg.

65½ De

TABLE V.—LOG. SINES, ETC.

24½ Deg.	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	25½ Deg.
	9'		10'	9'		10'	10'54		9'55	
45	621861	456	378139	663707	554	336293	1846	9'	8254	15
46	622135	456	377865	664039	553	335961	1904	9'	8259	14
47	622409	456	377591	664371	553	335629	1962	9'	8264	13
48	622682	455	377318	664703	553	335297	2021	9'	8269	12
49	622956	455	377044	665035	553	334965	2079	9'	8274	11
50	623229	455	376771	665366	552	334634	2137	9'	8279	10
51	623502	454	376498	665697	552	334303	2196	9'	8284	9
52	623774	454	376226	666029	552	333971	2254	9'	8289	8
53	624047	454	375953	666360	551	333640	2313	98	8294	7
54	624319	453	375681	666691	551	333309	2372	98	8299	6
55	624591	453	375409	667021	551	332979	2430	98	8304	5
56	624863	453	375137	667352	551	332648	2489	98	8309	4
57	625135	452	374865	667682	550	332318	2548	98	8314	3
58	625406	452	374594	668013	550	331987	2607	98	8319	2
59	625677	452	374323	668343	550	331657	2665	98	8324	1
60	625948	451	374052	668672	550	331328	2724	98	8329	65
1	626219	451	373781	669002	549	330998	2783	98	8334	59
2	626490	451	373510	669332	549	330668	2842	98	8339	54
3	626760	450	373240	669661	549	330339	2901	98	8344	5
4	627030	450	372970	669991	548	330009	2960	98	8349	5
5	627300	450	372700	670320	548	329680	3019	98	8354	5
6	627570	449	372430	670649	548	329351	3079	98	8359	5
7	627840	449	372160	670977	548	329023	3138	99	8364	5
8	628109	449	371891	671306	547	328694	3197	99	8369	5
9	628378	448	371622	671634	547	328366	3256	99	8374	5
10	628647	448	371353	671963	547	328037	3316	99	8379	5
11	628916	447	371084	672291	547	327709	3375	99	8384	64
12	629185	447	370815	672619	546	327381	3434	99	8389	48
13	629453	447	370547	672947	546	327053	3494	99	8394	4
14	629721	446	370279	673274	546	326726	3553	99	8399	46
15	629989	446	370011	673602	546	326398	3613	99	8404	45
16	630257	446	369743	673929	545	326071	3673	99	8409	44
17	630524	446	369476	674257	545	325743	3732	99	8414	43
18	630792	445	369208	674584	545	325416	3792	100	8419	42
19	631059	445	368941	674910	544	325090	3852	100	8424	41
20	631326	445	368674	675237	544	324763	3911	100	8429	64
21	631593	444	368407	675564	544	324436	3971	100	8434	39
22	631859	444	368141	675890	544	324110	4031	100	8439	38
23	632125	444	367875	676216	543	323784	4091	100	8444	37
24	632392	443	367608	676543	543	323457	4151	100	8449	36
25	632658	443	367342	676869	543	323131	4211	100	8454	35
26	632923	443	367077	677194	543	322806	4271	100	8459	34
27	633189	442	366811	677520	542	322480	4331	100	8464	33
28	633454	442	366546	677846	542	322154	4391	100	8469	32
29	633719	442	366281	678171	542	321829	4452	100	8474	31
30	633984	442	366016	678496	542	321504	4512	100	8479	64
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

66½ Deg.

64½ Deg.

25½ Deg.

TABLE V.—LOG. SINES, ETC.

26½ D

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'04		9'95	
25	30	633984		366016	678496		321504	4512	100	5488	
	31	634249	441	365751	678821	542	321179	4572	101	5428	
	32	634514	441	365486	679146	541	320854	4632	101	5368	
	33	634778	440	365222	679471	541	320529	4693	101	5307	
	34	635042	440	364958	679795	541	320205	4753	101	5247	
	35	635306	439	364694	680120	541	319880	4814	101	5186	
	36	635570	439	364430	680444	540	319556	4874	101	5126	
	37	635834	439	364166	680768	540	319232	4935	101	5065	
	38	636097	438	363903	681092	540	318908	4995	101	5005	64
25	39	636360	438	363640	681416	539	318584	5056	101	4944	
	40	636623	438	363377	681740	539	318260	5117	101	4883	
	41	636886	437	363114	682063	539	317937	5177	101	4823	
	42	637148	437	362852	682387	539	317613	5238	101	4762	
	43	637411	437	362589	682710	538	317290	5299	101	4701	
	44	637673	437	362327	683033	538	316967	5360	101	4640	
	45	637935	436	362065	683356	538	316644	5421	101	4579	
	46	638197	436	361803	683679	538	316321	5482	102	4518	
	47	638458	436	361542	684001	537	315999	5543	102	4457	64
25	48	638720	435	361280	684324	537	315676	5604	102	4396	
	49	638981	435	361019	684646	537	315354	5665	102	4335	
	50	639242	435	360758	684968	537	315032	5726	102	4274	
	51	639503	434	360497	685290	536	314710	5787	102	4213	
	52	639764	434	360236	685612	536	314388	5848	102	4152	
	53	640024	434	359976	685934	536	314066	5910	102	4090	
	54	640284	433	359716	686255	536	313745	5971	102	4029	
	55	640544	433	359456	686577	535	313423	6032	102	3968	
	56	640804	433	359196	686898	535	313102	6094	102	3906	64
25	57	641064	432	358936	687219	535	312781	6155	102	3845	
	58	641324	432	358676	687540	535	312460	6217	102	3783	
	59	641584	432	358416	687861	534	312139	6278	103	3722	
26	0	641842	431	358158	688182	534	311818	6340	103	3660	64
	1	642101	431	357899	688502	534	311498	6401	103	3599	
	2	642360	431	357640	688823	534	311177	6463	103	3537	
	3	642618	430	357382	689143	533	310857	6525	103	3475	
	4	642877	430	357123	689463	533	310537	6587	103	3413	
	5	643135	430	356865	689783	533	310217	6648	103	3352	63
26	6	643393	429	356607	690103	533	309897	6710	103	3290	
	7	643650	429	356350	690423	533	309577	6772	103	3228	
	8	643908	429	356092	690742	532	309258	6834	103	3166	
	9	644165	429	355835	691062	532	308938	6896	103	3104	
	10	644423	428	355577	691381	532	308619	6958	103	3042	
	11	644680	428	355320	691700	532	308300	7020	104	2980	
	12	644936	428	355064	692019	531	307981	7082	104	2918	
	13	645193	427	354807	692338	531	307662	7145	104	2855	
	14	645450	427	354550	692656	531	307344	7207	104	2793	
	15	645706	427	354294	692975	531	307025	7269	104	2731	63
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

64½ Deg.

63½ D

28½ Deg.

TABLE V.—LOG. SINES, ETC.

29¼ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'05		9'94	
28	30	678663	388	321337	734764	502	265236	6101	114	3899	30
	31	678895	387	321105	735066	502	264934	6170	114	3830	29
	32	679128	387	320872	735367	502	264633	6239	114	3761	28
	33	679360	387	320640	735668	501	264332	6307	115	3693	27
	34	679592	387	320408	735969	501	264031	6376	115	3624	26
	35	679824	387	320176	736269	501	263731	6445	115	3555	25
	36	680056	386	319944	736570	501	263430	6514	115	3486	24
	37	680288	386	319712	736871	501	263129	6583	115	3417	23
	38	680519	385	319481	737171	500	262829	6652	115	3348	61 22
28	39	680750	385	319250	737471	500	262529	6721	115	3279	21
	40	680982	385	319018	737771	500	262229	6790	115	3210	20
	41	681213	385	318787	738071	500	261929	6859	115	3141	19
	42	681443	384	318557	738371	500	261629	6928	115	3072	18
	43	681674	384	318326	738671	499	261329	6997	115	3003	17
	44	681905	384	318095	738971	499	261029	7066	115	2934	16
	45	682135	384	317865	739271	499	260729	7136	115	2864	15
	46	682365	383	317635	739570	499	260430	7205	116	2795	14
	47	682595	383	317405	739870	499	260130	7274	116	2726	61 13
28	48	682825	383	317175	740169	499	259831	7344	116	2656	12
	49	683055	383	316945	740468	498	259532	7413	116	2587	11
	50	683284	382	316716	740767	498	259233	7483	116	2517	10
	51	683514	382	316486	741066	498	258934	7552	116	2448	9
	52	683743	382	316257	741365	498	258635	7622	116	2378	8
	53	683972	382	316028	741664	498	258336	7692	116	2308	7
	54	684201	381	315799	741962	497	258038	7761	116	2239	6
	55	684430	381	315570	742261	497	257739	7831	116	2169	5
	56	684658	381	315342	742559	497	257441	7901	116	2099	61 4
28	57	684887	380	315113	742858	497	257142	7971	116	2029	3
	58	685115	380	314885	743156	497	256844	8041	116	1959	2
	59	685343	380	314657	743454	497	256546	8111	117	1889	1
29	0	685571	380	314429	743752	496	256248	8181	117	1819	61 0
	1	685799	379	314201	744050	496	255950	8251	117	1749	59
	2	686027	379	313973	744348	496	255652	8321	117	1679	58
	3	686254	379	313746	744645	496	255355	8391	117	1609	57
	4	686482	379	313518	744943	496	255057	8461	117	1539	56
	5	686709	378	313291	745240	495	254760	8531	117	1469	60 55
29	6	686936	378	313064	745538	495	254462	8602	117	1398	54
	7	687163	378	312837	745835	495	254165	8672	117	1328	53
	8	687389	378	312611	746132	495	253868	8742	117	1258	52
	9	687616	377	312384	746429	495	253571	8813	117	1187	51
	10	687843	377	312157	746726	495	253274	8883	117	1117	50
	11	688069	377	311931	747023	494	252977	8954	118	1046	49
	12	688295	377	311705	747319	494	252681	9025	118	0975	48
	13	688521	376	311479	747616	494	252384	9095	118	0905	47
	14	688747	376	311253	747913	494	252087	9166	118	0834	46
	15	688972	376	311028	748209	494	251791	9237	118	0763	60 45
		Cos.	D.	Sec.	Cot.	Tang.	Cosec.	D.	Sine		

61½ Deg.

80¾ Deg.

20 1/2 Deg

TABLE V.—LOG. SINES, ETC.

30 Deg.

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9'6		10'3	9'		10'	10'0		9'9	
29 15	88972	376	11028	748209	494	251791	59237	118	40763	45
16	89198	376	110802	748505	493	251495	59307	118	40693	44
17	89423	376	10577	748801	493	251199	59378	118	40622	43
18	89648	375	10352	749097	493	250903	59449	118	40551	42
19	89873	375	10127	749393	493	250607	59520	118	40480	41
20	90098	375	09902	749689	493	250311	59591	118	40409	40
21	90323	375	09677	749985	493	250015	59662	118	40338	39
22	90548	374	09452	750281	492	249719	59733	118	40267	38
23	90772	374	09228	750576	492	249424	59804	118	40196	60 37
29 24	90996	374	09004	750872	492	249128	59875	119	40125	36
25	91220	373	08780	751167	492	248833	59946	119	40054	35
26	91444	373	08556	751462	492	248538	60018	119	39982	34
27	91668	373	08332	751757	492	248243	60089	119	39911	33
28	91892	373	08108	752052	491	247948	60160	119	39840	32
29	92115	373	07885	752347	491	247653	60232	119	39768	31
30	92339	372	07661	752642	491	247358	60303	119	39697	30
31	92562	372	07438	752937	491	247063	60375	119	39625	29
32	92785	371	07215	753231	491	246769	60446	119	39554	60 28
29 33	93008	371	06992	753526	491	246474	60518	119	39482	27
34	93231	371	06769	753820	490	246180	60590	119	39410	26
35	93453	371	06547	754115	490	245885	60661	119	39339	25
36	93676	370	06324	754409	490	245591	60733	120	39267	24
37	93898	370	06102	754703	490	245297	60805	120	39195	23
38	94120	370	05880	754997	490	245003	60877	120	39123	22
39	94342	370	05658	755291	490	244709	60948	120	39052	21
40	94564	369	05436	755585	489	244415	61020	120	38980	20
41	94786	369	05214	755878	489	244122	61092	120	38908	60 19
29 42	95007	369	04993	756172	489	243828	61164	120	38836	18
43	95229	369	04771	756465	489	243535	61237	120	38763	17
44	95450	368	04550	756759	489	243241	61309	120	38691	16
45	95671	368	04329	757052	489	242948	61381	120	38619	15
46	95892	368	04108	757345	488	242655	61453	120	38547	14
47	96113	368	03887	757638	488	242362	61525	120	38475	13
48	96334	367	03666	757931	488	242069	61598	121	38402	12
49	96554	367	03446	758224	488	241776	61670	121	38330	11
50	96775	367	03225	758517	488	241483	61742	121	38258	60 10
29 51	96995	367	03005	758810	488	241190	61815	121	38185	9
52	97215	366	02785	759102	487	240898	61887	121	38113	8
53	97435	366	02565	759395	487	240605	61960	121	38040	7
54	97654	366	02346	759687	487	240313	62033	121	37967	6
55	97874	366	02126	759979	487	240021	62105	121	37895	5
56	98094	365	01906	760272	487	239728	62178	121	37822	4
57	98313	365	01687	760564	487	239436	62251	121	37749	3
58	98532	365	01468	760856	486	239144	62324	121	37676	2
59	98751	365	01249	761148	486	238852	62396	121	37604	1
60	98970	365	01030	761439		238561	62469		37531	60 0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

60 1/2 Deg.

60 D

31½ Deg.

TABLE V.—LOG. SINES, ETC.

32½ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9°		10°	9°		10°	10°		9°	
31	30	18085	343	81915	787319	472	212681	69234	129	30766	3
	31	18291	343	81709	787603	472	212397	69312	129	30688	2
	32	18497	343	81503	787886	472	212114	69389	129	30611	2
	33	18703	343	81297	788170	472	211830	69467	129	30533	2
	34	18909	343	81091	788453	472	211547	69544	129	30456	2
	35	19114	342	80886	788736	472	211264	69622	129	30378	2
	36	19320	342	80680	789019	472	210981	69700	129	30300	2
	37	19525	342	80475	789302	472	210698	69777	130	30223	2
	38	19730	342	80270	789585	471	210415	69855	130	30145	58 2
31	39	19935	341	80065	789868	471	210132	69933	130	30067	2
	40	20140	341	79860	790151	471	209849	70011	130	29989	2
	41	20345	341	79655	790433	471	209567	70089	130	29911	1
	42	20549	341	79451	790716	471	209284	70167	130	29833	1
	43	20754	340	79246	790999	471	209001	70245	130	29755	1
	44	20958	340	79042	791281	471	208719	70323	130	29677	1
	45	21162	340	78838	791563	471	208437	70401	130	29599	1
	46	21366	340	78634	791846	470	208154	70479	130	29521	1
	47	21570	340	78430	792128	470	207872	70558	130	29442	58 1
31	48	21774	339	78226	792410	470	207590	70636	131	29364	1
	49	21978	339	78022	792692	470	207308	70714	131	29286	1
	50	22181	339	77819	792974	470	207026	70793	131	29207	1
	51	22385	339	77615	793256	470	206744	70871	131	29129	1
	52	22588	339	77412	793538	469	206462	70950	131	29050	1
	53	22791	339	77209	793819	469	206181	71028	131	28972	1
	54	22994	338	77006	794101	469	205899	71107	131	28893	1
	55	23197	338	76803	794383	469	205617	71185	131	28815	1
	56	23400	338	76600	794664	469	205336	71264	131	28736	58
31	57	23603	337	76397	794945	469	205055	71343	131	28657	1
	58	23805	337	76195	795227	469	204773	71422	131	28578	1
	59	24007	337	75993	795508	468	204492	71501	131	28499	1
32	0	24210	337	75790	795789	468	204211	71580	131	28420	58
	1	24412	337	75588	796070	468	203930	71658	132	28342	5
	2	24614	337	75386	796351	468	203649	71737	132	28263	5
	3	24816	336	75184	796632	468	203368	71817	132	28183	5
	4	25017	336	74983	796913	468	203087	71896	132	28104	5
	5	25219	336	74781	797194	468	202806	71975	132	28025	57 5
32	6	25420	335	74580	797475	468	202525	72054	132	27946	5
	7	25622	335	74378	797755	468	202245	72133	132	27867	5
	8	25823	335	74177	798036	467	201964	72213	132	27787	5
	9	26024	335	73976	798316	467	201684	72292	132	27708	5
	10	26225	335	73775	798596	467	201404	72371	132	27629	5
	11	26426	335	73574	798877	467	201123	72451	132	27549	4
	12	26626	334	73374	799157	467	200843	72530	132	27470	4
	13	26827	334	73173	799437	467	200563	72610	133	27390	4
	14	27027	334	72973	799717	467	200283	72690	133	27310	4
	15	27228	334	72772	799997	467	200003	72769	133	27231	57 4
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

58½ Deg.

57½ Deg.

32½ Deg.

TABLE V.—LOG. SINES, ETC.

33 Deg.

°	Sine.	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9'		10'	9'		10'	10'07		9'92	
32 15	727228	334	272772	799997	466	200003	2769	133	7231	45
16	727428	333	272572	800277	466	199723	2849	133	7151	44
17	727628	333	272372	800557	466	199443	2929	133	7071	43
18	727828	333	272172	800836	466	199164	3009	133	6991	42
19	728027	333	271973	801116	466	198884	3089	133	6911	41
20	728227	333	271773	801396	466	198604	3169	133	6831	40
21	728427	333	271573	801675	466	198325	3249	133	6751	39
22	728626	332	271374	801955	466	198045	3329	133	6671	38
23	728825	332	271175	802234	465	197766	3409	133	6591	57 37
32 24	729024	332	270976	802513	465	197487	3489	134	6511	36
25	729223	331	270777	802792	465	197208	3569	134	6431	35
26	729422	331	270578	803072	465	196928	3649	134	6351	34
27	729621	331	270379	803351	465	196649	3730	134	6270	33
28	729820	331	270180	803630	465	196370	3810	134	6190	32
29	730018	330	269982	803908	465	196092	3890	134	6110	31
30	730216	330	269784	804187	465	195813	3971	134	6029	30
31	730415	330	269585	804466	465	195534	4051	134	5949	29
32	730613	330	269387	804745	464	195255	4132	134	5868	57 28
32 33	730811	330	269189	805023	464	194977	4212	134	5788	27
34	731009	329	268991	805302	464	194698	4293	134	5707	26
35	731206	329	268794	805580	464	194420	4374	134	5626	25
36	731404	329	268596	805859	464	194141	4455	135	5545	24
37	731602	329	268398	806137	464	193863	4535	135	5465	23
38	731799	329	268201	806415	464	193585	4616	135	5384	22
39	731996	328	268004	806693	463	193307	4697	135	5303	21
40	732193	328	267807	806971	463	193029	4778	135	5222	20
41	732390	328	267610	807249	463	192751	4859	135	5141	57 19
32 42	732587	328	267413	807527	463	192473	4940	135	5060	18
43	732784	328	267216	807805	463	192195	5021	135	4979	17
44	732980	327	267020	808083	463	191917	5103	135	4897	16
45	733177	327	266823	808361	463	191639	5184	135	4816	15
46	733373	327	266627	808638	462	191362	5265	136	4735	14
47	733569	327	266431	808916	462	191084	5346	136	4654	13
48	733765	327	266235	809193	462	190807	5428	136	4572	12
49	733961	326	266039	809471	462	190529	5509	136	4491	11
50	734157	326	265843	809748	462	190252	5591	136	4409	57 10
32 51	734353	326	265647	810025	462	189975	5672	136	4328	9
52	734549	326	265451	810302	462	189698	5754	136	4246	8
53	734744	325	265256	810580	462	189420	5836	136	4164	7
54	734939	325	265061	810857	462	189143	5917	136	4083	6
55	735135	325	264865	811134	461	188866	5999	136	4001	5
56	735330	325	264670	811410	461	188590	6081	136	3919	4
57	735525	325	264475	811687	461	188313	6163	136	3837	3
58	735719	325	264281	811964	461	188036	6245	137	3755	2
59	735914	324	264086	812241	461	187759	6327	137	3673	1
60	736109	324	263891	812517	461	187483	6409	137	3591	57 0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

57½ Deg.

57 Deg.

84½ Deg.

TABLE V.—LOG. SINES, ETC.

35½ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'08		9'91	
34	30	753128	306	246872	837134	451	162866	4006	145	5994	30
	31	753312	306	246688	837405	451	162595	4093	145	5907	29
	32	753495	306	246505	837675	451	162325	4180	145	5820	28
	33	753679	306	246321	837946	451	162054	4267	145	5733	27
	34	753862	305	246138	838216	451	161784	4354	145	5646	26
	35	754046	305	245954	838487	451	161513	4441	145	5559	25
	36	754229	305	245771	838757	450	161243	4528	145	5472	24
	37	754412	305	245588	839027	450	160973	4615	145	5385	23
	38	754595	305	245405	839297	450	160703	4703	145	5297	55 22
34	39	754778	304	245222	839568	450	160432	4790	145	5210	21
	40	754960	304	245040	839838	450	160162	4877	146	5123	20
	41	755143	304	244857	840108	450	159892	4965	146	5035	19
	42	755326	304	244674	840378	450	159622	5052	146	4948	18
	43	755508	304	244492	840647	450	159353	5140	146	4860	17
	44	755690	304	244310	840917	449	159083	5227	146	4773	16
	45	755872	303	244128	841187	449	158813	5315	146	4685	15
	46	756054	303	243946	841457	449	158543	5402	146	4598	14
	47	756236	303	243764	841726	449	158274	5490	146	4510	55 13
34	48	756418	303	243582	841996	449	158004	5578	146	4422	12
	49	756600	303	243400	842266	449	157734	5666	146	4334	11
	50	756782	302	243218	842535	449	157465	5754	147	4246	10
	51	756963	302	243037	842805	449	157195	5842	147	4158	9
	52	757144	302	242856	843074	449	156926	5930	147	4070	8
	53	757326	302	242674	843343	449	156657	6018	147	3982	7
	54	757507	302	242493	843612	449	156388	6106	147	3894	6
	55	757688	301	242312	843882	448	156118	6194	147	3806	5
	56	757869	301	242131	844151	448	155849	6282	147	3718	55 4
34	57	758050	301	241950	844420	448	155580	6370	147	3630	3
	58	758230	301	241770	844689	448	155311	6459	147	3541	2
	59	758411	301	241589	844958	448	155042	6547	147	3453	1
35	0	758591	301	241409	845227	448	154773	6635	147	3365	55 0
	1	758772	300	241228	845496	448	154504	6724	147	3276	59
	2	758952	300	241048	845764	448	154236	6813	148	3187	58
	3	759132	300	240868	846033	448	153967	6901	148	3099	57
	4	759312	300	240688	846302	448	153698	6990	148	3010	56
	5	759492	300	240508	846570	447	153430	7078	148	2922	54 55
35	6	759672	299	240328	846839	447	153161	7167	148	2833	54
	7	759852	299	240148	847107	447	152893	7256	148	2744	53
	8	760031	299	239969	847376	447	152624	7345	148	2655	52
	9	760211	299	239789	847644	447	152356	7434	148	2566	51
	10	760390	299	239610	847913	447	152087	7523	148	2477	50
	11	760569	298	239431	848181	447	151819	7612	148	2388	49
	12	760748	298	239252	848449	447	151551	7701	149	2299	48
	13	760927	298	239073	848717	447	151283	7790	149	2210	47
	14	761106	298	238894	848986	447	151014	7879	149	2121	46
	15	761285	298	238715	849254	447	150746	7969	149	2031	54 45
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

55½ Deg.

54½ Deg.

35½ Deg.		TABLE V.—LOG. SINES, ETC.								36 Deg.	
°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Coa.	
		9'7		10'2	9'		10'	10'0		9'9	
35	15	61285	298	38715	849254	447	150746	87969	149	12031	45
	16	61464	298	38536	849522	447	150478	88058	149	11942	44
	17	61642	297	38358	849790	446	150210	88147	149	11853	43
	18	61821	297	38179	850058	446	149942	88237	149	11763	42
	19	61999	297	38001	850325	446	149675	88326	149	11674	41
	20	62177	297	37823	850593	446	149407	88416	149	11584	40
	21	62356	297	37644	850861	446	149139	88505	149	11495	39
	22	62534	296	37466	851129	446	148871	88595	149	11405	38
	23	62712	296	37288	851396	446	148604	88685	150	11315	54 37
	24	62889	296	37111	851664	446	148336	88774	150	11226	36
35	25	63067	296	36933	851931	446	148069	88864	150	11136	35
	26	63245	296	36755	852199	446	147801	88954	150	11046	34
	27	63422	296	36578	852466	446	147534	89044	150	10956	33
	28	63600	295	36400	852733	445	147267	89134	150	10866	32
	29	63777	295	36223	853001	445	146999	89224	150	10776	31
	30	63954	295	36046	853268	445	146732	89314	150	10686	30
	31	64131	295	35869	853535	445	146465	89404	150	10596	29
	32	64308	295	35692	853802	445	146198	89494	150	10506	54 28
	33	64485	294	35515	854069	445	145931	89585	150	10415	27
	34	64662	294	35338	854336	445	145664	89675	151	10325	26
	35	64838	294	35162	854603	445	145397	89765	151	10235	25
	36	65015	294	34985	854870	445	145130	89856	151	10144	24
	37	65191	294	34809	855137	445	144863	89946	151	10054	23
	38	65367	294	34633	855404	445	144596	90037	151	9963	22
	39	65544	293	34456	855671	444	144329	90127	151	9873	21
	40	65720	293	34280	855938	444	144062	90218	151	9782	20
	41	65896	293	34104	856204	444	143796	90309	151	9691	54 19
	42	66072	293	33928	856471	444	143529	90399	151	9601	18
	43	66247	293	33753	856737	444	143263	90490	151	9510	17
	44	66423	293	33577	857004	444	142996	90581	151	9419	16
	45	66598	292	33402	857270	444	142730	90672	152	9328	15
	46	66774	292	33226	857537	444	142463	90763	152	9237	14
	47	66949	292	33051	857803	444	142197	90854	152	9146	13
	48	67124	292	32876	858069	444	141931	90945	152	9055	12
	49	67300	292	32700	858336	444	141664	91036	152	8964	11
	50	67475	291	32525	858602	443	141398	91127	152	8873	54 10
	51	67649	291	32351	858868	443	141132	91219	152	8781	9
15	52	67824	291	32176	859134	443	140866	91310	152	8690	8
	53	67999	291	32001	859400	443	140600	91401	152	8599	7
	54	68173	291	31827	859666	443	140334	91493	152	8507	6
	55	68348	290	31652	859932	443	140068	91584	153	8416	5
	56	68522	290	31478	860198	443	139802	91676	153	8324	4
	57	68697	290	31303	860464	443	139536	91767	153	8233	3
	58	68871	290	31129	860730	443	139270	91859	153	8141	2
	59	69045	290	30955	860995	443	139005	91951	153	8049	1
	60	69219		30781	861261	443	138739	92042	153	7958	54 0
		Coa.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

1½ Deg.

54 Deg.

34½ Deg.

TABLE V.—LOG. SINES, ETC.

35½ Deg.

°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'08		9'91	
34	30	753128	306	246872	837134	451	162866	4006	145	5994	30
	31	753312	306	246688	837405	451	162595	4093	145	5907	29
	32	753495	306	246505	837675	451	162325	4180	145	5820	28
	33	753679	306	246321	837946	451	162054	4267	145	5733	27
	34	753862	306	246138	838216	451	161784	4354	145	5646	26
	35	754046	305	245954	838487	451	161513	4441	145	5559	25
	36	754229	305	245771	838757	450	161243	4528	145	5472	24
	37	754412	305	245588	839027	450	160973	4615	145	5385	23
	38	754595	305	245405	839297	450	160703	4703	145	5297	55 22
34	39	754778	304	245222	839568	450	160432	4790	145	5210	21
	40	754960	304	245040	839838	450	160162	4877	146	5123	20
	41	755143	304	244857	840108	450	159892	4965	146	5035	19
	42	755326	304	244674	840378	450	159622	5052	146	4948	18
	43	755508	304	244492	840647	450	159353	5140	146	4860	17
	44	755690	304	244310	840917	449	159083	5227	146	4773	16
	45	755872	304	244128	841187	449	158813	5315	146	4685	15
	46	756054	303	243946	841457	449	158543	5402	146	4598	14
	47	756236	303	243764	841726	449	158274	5490	146	4510	55 13
34	48	756418	303	243582	841996	449	158004	5578	146	4422	12
	49	756600	303	243400	842266	449	157734	5666	146	4334	11
	50	756782	302	243218	842535	449	157465	5754	147	4246	10
	51	756963	302	243037	842805	449	157195	5842	147	4158	9
	52	757144	302	242856	843074	449	156926	5930	147	4070	8
	53	757326	302	242674	843343	449	156657	6018	147	3982	7
	54	757507	302	242493	843612	449	156388	6106	147	3894	6
	55	757688	301	242312	843882	448	156118	6194	147	3806	5
	56	757869	301	242131	844151	448	155849	6282	147	3718	55 4
34	57	758050	301	241950	844420	448	155580	6370	147	3630	3
	58	758230	301	241770	844689	448	155311	6459	147	3541	2
	59	758411	301	241589	844958	448	155042	6547	147	3453	1
35	0	758591	301	241409	845227	448	154773	6635	147	3365	55 0
	1	758772	300	241228	845496	448	154504	6724	147	3276	59
	2	758952	300	241048	845764	448	154236	6813	147	3187	58
	3	759132	300	240868	846033	448	153967	6901	148	3099	57
	4	759312	300	240688	846302	448	153698	6990	148	3010	56
	5	759492	300	240508	846570	447	153430	7078	148	2922	54 55
35	6	759672	299	240328	846839	447	153161	7167	148	2833	54
	7	759852	299	240148	847107	447	152893	7256	148	2744	53
	8	760031	299	239969	847376	447	152624	7345	148	2655	52
	9	760211	299	239789	847644	447	152356	7434	148	2566	51
	10	760390	299	239610	847913	447	152087	7523	148	2477	50
	11	760569	299	239431	848181	447	151819	7612	148	2388	49
	12	760748	298	239252	848449	447	151550	7701	148	2299	48
	13	760927	298	239073	848717	447	151281	7790	148	2210	47
	14	761106	298	238894	848986	447	151012	7879	148	2121	46
	15	761285	298	238715	849254	447	150743	7968	148	2032	45
		Cos.	D.	Sec.	Cot.	D.	Tan.				

55½ Deg.

35½ Deg.

TABLE V.—LOG. SINES, ETC.

36 Deg.

°		Sine	D.	Cosec.	Tang.	D.	Col.	Sec.	D.	Cos.	
		9'7		10'2	9'		10'	10'0		9'9	
35	15	61285	298	38715	849254	447	150746	87969	149	12031	45
	16	61464	298	38536	849522	447	150478	88058	149	11942	44
	17	61642	297	38358	849790	446	150210	88147	149	11853	43
	18	61821	297	38179	850058	446	149942	88237	149	11763	42
	19	61999	297	38001	850325	446	149675	88326	149	11674	41
	20	62177	297	37823	850593	446	149407	88416	149	11584	40
	21	62356	297	37644	850861	446	149139	88505	149	11495	39
	22	62534	296	37466	851129	446	148871	88595	149	11405	38
	23	62712	296	37288	851396	446	148604	88685	149	11315	54 37
35	24	62889	296	37111	851664	446	148336	88774	150	11226	36
	25	63067	296	36933	851931	446	148069	88864	150	11136	35
	26	63245	296	36755	852199	446	147801	88954	150	11046	34
	27	63422	296	36578	852466	446	147534	89044	150	10956	33
	28	63600	295	36400	852733	445	147267	89134	150	10866	32
	29	63777	295	36223	853001	445	146999	89224	150	10776	31
	30	63954	295	36046	853268	445	146732	89314	150	10686	30
	31	64131	295	35869	853535	445	146465	89404	150	10596	29
	32	64308	295	35692	853802	445	146198	89494	150	10506	54 28
35	33	64485	294	35515	854069	445	145931	89585	150	10415	27
	34	64662	294	35338	854336	445	145664	89675	151	10325	26
	35	64838	294	35162	854603	445	145397	89765	151	10235	25
	36	65015	294	34985	854870	445	145130	89856	151	10144	24
	37	65191	294	34809	855137	445	144863	89946	151	10054	23
	38	65367	294	34633	855404	445	144596	90037	151	9963	22
	39	65544	293	34456	855671	444	144329	90127	151	9873	21
	40	65720	293	34280	855938	444	144062	90218	151	9782	20
	41	65896	293	34104	856204	444	143796	90309	151	9691	54 19
35	42	66072	293	33928	856471	444	143529	90399	151	9601	18
	43	66247	293	33753	856737	444	143263	90490	151	9510	17
	44	66423	293	33577	857004	444	142996	90581	151	9419	16
	45	66598	292	33402	857270	444	142730	90672	151	9328	15
	46	66774	292	33226	857537	444	142463	90763	152	9237	14
	47	66949	292	33051	857803	444	142197	90854	152	9146	13
	48	67124	292	32876	858069	444	141931	90945	152	9055	12
	49	67300	292	32700	858336	444	141664	91036	152	8964	11
	50	67475	292	32525	858602	443	141398	91127	152	8873	54 10
5	51	67650	291	32350	858868	443	141132	91218	152	8781	9
	52	67825	291	32175	859134	443	140865	91309	152	8690	8
	53	67999	291	32000	859400	443	140599	91400	152	8599	7
	54	68174	290	31825	859666	443	140332	91491	152	8507	6
	55	68348	290	31650	859932	443	140066	91582	152	8416	5
	56	68522	290	31475	860198	443	139800	91673	152	8324	4
	57	68696	290	31300	860464	443	139534	91764	152	8233	3
	58	68869	290	31125	860730	443	139268	91855	152	8141	2
	59	69043	290	30950	860995	443	139002	91946	152	8050	1
	60	69216	290	30775	861261	443	138736	92037	152	7959	0

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37½ Deg.		TABLE V.—LOG. SINES, ETC.								38½ Deg.	
°		Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10'10		9'89	
37	30	784447		215553	884980		115020	0533	162	9467	30
	31	784612	274	215388	885242	436	114758	0630	162	9370	29
	32	784776	274	215224	885503	436	114497	0727	162	9273	28
	33	784941	274	215059	885765	436	114235	0824	162	9176	27
	34	785105	274	214895	886026	436	113974	0922	162	9078	26
	35	785269	274	214731	886288	436	113712	1019	162	8981	25
	36	785433	273	214567	886549	436	113451	1116	162	8884	24
	37	785597	273	214403	886810	435	113190	1213	162	8787	23
	38	785761	273	214239	887072	435	112928	1311	162	8689	52 22
	39	785925	273	214075	887333	435	112667	1408	162	8592	21
	40	786089	273	213911	887594	435	112406	1506	163	8494	20
	41	786252	272	213748	887855	435	112145	1603	163	8397	19
	42	786416	272	213584	888116	435	111884	1701	163	8299	18
	43	786579	272	213421	888377	435	111623	1798	163	8202	17
	44	786742	272	213258	888639	435	111361	1896	163	8104	16
	45	786906	272	213094	888900	435	111100	1994	163	8006	15
	46	787069	272	212931	889160	435	110840	2092	163	7908	14
	47	787232	271	212768	889421	435	110579	2190	163	7810	52 13
	48	787395	271	212605	889682	435	110318	2288	163	7712	12
	49	787557	271	212443	889943	435	110057	2386	163	7614	11
	50	787720	271	212280	890204	434	109796	2484	163	7516	10
	51	787883	271	212117	890465	434	109535	2582	164	7418	9
	52	788045	271	211955	890725	434	109275	2680	164	7320	8
	53	788208	271	211792	890986	434	109014	2778	164	7222	7
	54	788370	270	211630	891247	434	108753	2877	164	7123	6
	55	788532	270	211468	891507	434	108493	2975	164	7025	5
	56	788694	270	211306	891768	434	108232	3074	164	6926	52 4
	57	788856	270	211144	892028	434	107972	3172	164	6828	3
	58	789018	270	210982	892289	434	107711	3271	164	6729	2
	59	789180	270	210820	892549	434	107451	3369	164	6631	1
38	0	789342	269	210658	892810	434	107190	3468	164	6532	52 0
	1	789504	269	210496	893070	434	106930	3567	165	6433	59
	2	789665	269	210335	893331	434	106669	3665	165	6335	58
	3	789827	269	210173	893591	434	106409	3764	165	6236	57
	4	789988	269	210012	893851	434	106149	3863	165	6137	56
	5	790149	269	209851	894111	434	105889	3962	165	6038	51 55
	6	790310	268	209690	894371	434	105629	4061	165	5939	54
	7	790471	268	209529	894632	433	105368	4160	165	5840	53
	8	790632	268	209368	894892	433	105108	4259	165	5741	52
	9	790793	268	209207	895152	433	104848	4359	165	5641	51
	10	790954	268	209046	895412	433	104588	4458	165	5542	50
	11	791115	268	208885	895672	433	104328	4557	166	5443	49
	12	791275	267	208725	895932	433	104068	4657	166	5343	48
	13	791436	267	208564	896192	433	103808	4756	166	5244	47
	14	791596	267	208404	896452	433	103548	4855	166	5145	46
	15	791757	267	208243	896712	433	103288	4955	166	5045	51 45
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

52½ Deg.

51½ Deg.

38½ Deg. TABLE V.—LOG. SINES, ETC. 39 Deg.

°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'		10'	9'		10'	10' 10		9' 89	
38	15	791757	267	208243	896712	433	103288	4955	166	5045	45
	16	791917	267	208083	896971	433	103029	5055	166	4945	44
	17	792077	267	207923	897231	433	102769	5154	166	4846	43
	18	792237	266	207763	897491	433	102509	5254	166	4746	42
	19	792397	266	207603	897751	433	102249	5354	166	4646	41
	20	792557	266	207443	898010	433	101990	5454	166	4546	40
	21	792716	266	207284	898270	433	101730	5554	167	4446	39
	22	792876	266	207124	898530	433	101470	5654	167	4346	38
	23	793035	266	206965	898789	433	101211	5754	167	4246	51 37
38	24	793195	265	206805	899049	432	100951	5854	167	4146	36
	25	793354	265	206646	899308	432	100692	5954	167	4046	35
	26	793514	265	206486	899568	432	100432	6054	167	3946	34
	27	793673	265	206327	899827	432	100173	6154	167	3846	33
	28	793832	265	206168	900086	432	999914	6255	167	3745	32
	29	793991	265	206009	900346	432	999654	6355	167	3645	31
	30	794150	264	205850	900605	432	999395	6456	167	3544	30
	31	794308	264	205692	900864	432	999136	6556	168	3444	29
	32	794467	264	205533	901124	432	998876	6657	168	3343	51 28
38	33	794626	264	205374	901383	432	998617	6757	168	3243	27
	34	794784	264	205216	901642	432	998358	6858	168	3142	26
	35	794942	264	205058	901901	432	998099	6959	168	3041	25
	36	795101	264	204899	902160	432	997840	7060	168	2940	24
	37	795259	263	204741	902419	432	997581	7161	168	2839	23
	38	795417	263	204583	902679	432	997321	7261	168	2739	22
	39	795575	263	204425	902938	432	997062	7362	168	2638	21
	40	795733	263	204267	903197	431	996803	7464	168	2536	20
	41	795891	263	204109	903455	431	996545	7565	169	2435	51 19
38	42	796049	263	203951	903714	431	996286	7666	169	2334	18
	43	796206	263	203794	903973	431	996027	7767	169	2233	17
	44	796364	262	203636	904232	431	995768	7868	169	2132	16
	45	796521	262	203479	904491	431	995509	7970	169	2030	15
	46	796679	262	203321	904750	431	995250	8071	169	1929	14
	47	796836	262	203164	905008	431	994992	8173	169	1827	13
	48	796993	262	203007	905267	431	994733	8274	169	1726	12
	49	797150	261	202850	905526	431	994474	8376	169	1624	11
	50	797307	261	202693	905784	431	994216	8477	170	1523	51 10
38	51	797464	261	202536	906043	431	993957	8579	170	1421	9
	52	797621	261	202379	906302	431	993698	8681	170	1319	8
	53	797777	261	202223	906560	431	993440	8783	170	1217	7
	54	797934	261	202066	906819	431	993181	8885	170	1115	6
	55	798091	261	201909	907077	431	992923	8987	170	1013	5
	56	798247	261	201753	907336	431	992664	9089	170	911	4
	57	798403	260	201597	907594	431	992406	9191	170	809	3
	58	798560	260	201440	907852	431	992148	9293	170	707	2
	59	798716	260	201284	908111	431	991889	9395	170	605	1
	60	798872	260	201128	908369	430	991631	9497	170	503	51 0
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

1½ Deg.

51 Deg.

40½ Deg.

TABLE V.—LOG. SINES, ETC.

41½ Deg.

°	Sine.	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9° 8'		10° 1'	9°		10°	10° 1'		9° 8'	
40 30	12544	246	87456	931499	426	068501	18954	180	81046	30
31	12692	246	87308	931755	426	068245	19062	180	80938	29
32	12840	246	87160	932010	426	067990	19170	180	80830	28
33	12988	246	87012	932266	426	067734	19278	180	80722	27
34	13135	246	86865	932522	426	067478	19387	180	80613	26
35	13283	246	86717	932778	426	067222	19495	180	80505	25
36	13430	246	86570	933033	426	066967	19603	180	80397	24
37	13578	245	86422	933289	426	066711	19711	181	80289	23
38	13725	245	86275	933545	426	066455	19820	181	80180	49 22
40 39	13872	245	86128	933800	426	066200	19928	181	80072	21
40	14019	245	85981	934056	426	065944	20037	181	79963	20
41	14166	245	85834	934311	426	065689	20145	181	79855	19
42	14313	245	85687	934567	426	065433	20254	181	79746	18
43	14460	244	85540	934823	426	065177	20363	181	79637	17
44	14607	244	85393	935078	426	064922	20471	181	79529	16
45	14753	244	85247	935333	426	064667	20580	181	79420	15
46	14900	244	85100	935589	426	064411	20689	181	79311	14
47	15046	244	84954	935844	426	064156	20798	182	79202	49 13
40 48	15193	244	84807	936100	426	063900	20907	182	79093	12
49	15339	244	84661	936355	426	063645	21016	182	78984	11
50	15485	243	84515	936610	426	063390	21125	182	78875	10
51	15632	243	84368	936866	425	063134	21234	182	78766	9
52	15778	243	84222	937121	425	062879	21344	182	78656	8
53	15924	243	84076	937376	425	062624	21453	182	78547	7
54	16069	243	83931	937632	425	062368	21562	182	78438	6
55	16215	243	83785	937887	425	062113	21672	182	78328	5
56	16361	243	83639	938142	425	061858	21781	183	78219	49 4
40 57	16507	242	83493	938398	425	061602	21891	183	78109	3
58	16652	242	83348	938653	425	061347	22001	183	77999	2
59	16798	242	83202	938908	425	061092	22110	183	77890	1
41 0	16943	242	83057	939163	425	060837	22220	183	77780	49 0
1	17088	242	82912	939418	425	060582	22330	183	77670	59
2	17233	242	82767	939673	425	060327	22440	183	77560	58
3	17379	242	82621	939928	425	060072	22550	183	77450	57
4	17524	241	82476	940183	425	059817	22660	183	77340	56
5	17668	241	82332	940438	425	059562	22770	184	77230	48 55
41 6	17813	241	82187	940694	425	059306	22880	184	77120	54
7	17958	241	82042	940949	425	059051	22990	184	77010	53
8	18103	241	81897	941204	425	058796	23101	184	76899	52
9	18247	241	81753	941458	425	058542	23211	184	76789	51
10	18392	241	81608	941714	425	058286	23322	184	76678	50
11	18536	241	81464	941968	425	058032	23432	184	76568	49
12	18681	240	81319	942223	425	057777	23543	184	76457	48
13	18825	240	81175	942478	425	057522	23653	184	76347	47
14	18969	240	81031	942733	425	057267	23764	185	76236	46
15	19113	240	80887	942988	425	057012	23875	185	76125	48 45
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

49½ Deg.

48½ Deg.

41 $\frac{1}{2}$ Deg.		TABLE V.—LOG. SINES, ETC.								42 Deg.	
	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.		
	9'		10'	9'		10'	10'12		9'87		
41	819113	240	180887	942988	425	057012	3875	185	6125		45
16	819257	240	180743	943243	425	056757	3986	185	6014		44
17	819401	240	180599	943498	425	056502	4096	185	5904		43
18	819545	239	180455	943752	425	056248	4207	185	5793		42
19	819689	239	180311	944007	425	055993	4318	185	5682		41
20	819832	239	180168	944262	425	055738	4429	185	5571		40
21	819976	239	180024	944517	425	055483	4541	185	5459		39
22	820120	239	179880	944771	424	055229	4652	185	5348		38
23	820263	239	179737	945026	424	054974	4763	185	5237	48	37
41	820406	239	179594	945281	424	054719	4874	186	5126		36
25	820550	238	179450	945535	424	054465	4986	186	5014		35
26	820693	238	179307	945790	424	054210	5097	186	4903		34
27	820836	238	179164	946045	424	053955	5209	186	4791		33
28	820979	238	179021	946299	424	053701	5320	186	4680		32
29	821122	238	178878	946554	424	053446	5432	186	4568		31
30	821265	238	178735	946808	424	053192	5544	186	4456		30
31	821407	238	178593	947063	424	052937	5656	186	4344		29
32	821550	238	178450	947318	424	052682	5768	187	4232	48	28
41	821693	237	178307	947572	424	052428	5879	187	4121		27
34	821835	237	178165	947826	424	052174	5991	187	4009		26
35	821977	237	178023	948081	424	051919	6104	187	3896		25
36	822120	237	177880	948336	424	051664	6216	187	3784		24
37	822262	237	177738	948590	424	051410	6328	187	3672		23
38	822404	237	177596	948844	424	051156	6440	187	3560		22
39	822546	237	177454	949099	424	050901	6552	187	3448		21
40	822688	236	177312	949353	424	050647	6665	187	3335		20
41	822830	236	177170	949607	424	050393	6777	187	3223	48	19
41	822972	236	177028	949862	424	050138	6890	188	3110		18
43	823114	236	176886	950116	424	049884	7002	188	2998		17
44	823255	236	176745	950370	424	049630	7115	188	2885		16
45	823397	236	176603	950625	424	049375	7228	188	2772		15
46	823539	236	176461	950879	424	049121	7341	188	2659		14
47	823680	235	176320	951133	424	048867	7453	188	2547		13
48	823821	235	176179	951388	424	048612	7566	188	2434		12
49	823963	235	176037	951642	424	048358	7679	188	2321		11
50	824104	235	175896	951896	424	048104	7792	188	2208	48	10
41	824245	235	175755	952150	424	047850	7905	189	2095		9
52	824386	235	175614	952405	424	047595	8019	189	1981		8
53	824527	235	175473	952659	424	047341	8132	189	1868		7
54	824668	234	175332	952913	424	047087	8245	189	1755		6
55	824808	234	175192	953167	423	046833	8359	189	1641		5
56	824949	234	175051	953421	423	046579	8472	189	1528		4
57	825090	234	174910	953675	423	046325	8586	189	1414		3
58	825230	234	174770	953929	423	046071	8699	189	1301		2
59	825371	234	174629	954183	423	045817	8813	189	1187		1
60	825511	234	174489	954437	423	045563	8927	189	1073	48	0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine		

43½ Deg.

TABLE V.—LOG. SINES, ETC.

44¼ Deg.

°	'	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
		9'8		10'1	9'9		10'0	10'1		9'8	
43	30	37812	222	62188	77250	422	22750	39438	200	60562	30
	31	37945	222	62055	77503	422	22497	39558	200	60442	29
	32	38078	221	61922	77756	422	22244	39678	200	60322	28
	33	38211	221	61789	78009	422	21991	39798	200	60202	27
	34	38344	221	61656	78262	422	21738	39918	200	60082	26
	35	38477	221	61523	78515	422	21485	40038	200	59962	25
	36	38610	221	61390	78768	422	21232	40158	200	59842	24
	37	38742	221	61258	79021	422	20979	40279	201	59721	23
	38	38875	221	61125	79274	422	20726	40399	201	59601	46 22
43	39	39007	221	60993	79527	422	20473	40520	201	59480	21
	40	39140	220	60860	79780	422	20220	40640	201	59360	20
	41	39272	220	60728	80033	422	19967	40761	201	59239	19
	42	39404	220	60596	80286	422	19714	40881	201	59119	18
	43	39536	220	60464	80538	422	19462	41002	201	58998	17
	44	39668	220	60332	80791	421	19210	41123	201	58877	16
	45	39800	220	60200	81044	421	18956	41244	202	58756	15
	46	39932	220	60068	81297	421	18703	41365	202	58635	14
	47	40064	219	59936	81550	421	18450	41486	202	58514	46 13
43	48	40196	219	59804	81803	421	18197	41607	202	58393	12
	49	40328	219	59672	82056	421	17944	41728	202	58272	11
	50	40459	219	59541	82309	421	17691	41849	202	58151	10
	51	40591	219	59409	82562	421	17438	41971	202	58029	9
	52	40722	219	59278	82814	421	17186	42092	202	57908	8
	53	40854	219	59146	83067	421	16933	42214	202	57786	7
	54	40985	219	59015	83320	421	16680	42335	203	57665	6
	55	41116	218	58884	83573	421	16427	42457	203	57543	5
	56	41247	218	58753	83826	421	16174	42578	203	57422	46 4
43	57	41378	218	58622	84079	421	15921	42700	203	57300	3
	58	41509	218	58491	84331	421	15669	42822	203	57178	2
	59	41640	218	58360	84584	421	15416	42944	203	57056	1
44	0	41771	218	58229	84837	421	15163	43066	203	56934	46 0
	1	41902	218	58098	85090	421	14910	43188	203	56812	59
	2	42033	218	57967	85343	421	14657	43310	204	56690	58
	3	42163	217	57837	85596	421	14404	43432	204	56568	57
	4	42294	217	57706	85848	421	14152	43554	204	56446	56
	5	42424	217	57576	86101	421	13899	43677	204	56323	45 55
44	6	42555	217	57445	86354	421	13646	43799	204	56201	54
	7	42685	217	57315	86607	421	13393	43922	204	56078	53
	8	42815	217	57185	86860	421	13140	44044	204	55956	52
	9	42946	217	57054	87112	421	12888	44167	204	55833	51
	10	43076	217	56924	87365	421	12635	44289	205	55711	50
	11	43206	216	56794	87618	421	12382	44412	205	55588	49
	12	43336	216	56664	87871	421	12129	44535	205	55465	48
	13	43466	216	56534	88123	421	11877	44658	205	55342	47
	14	43595	216	56405	88376	421	11624	44781	205	55219	46
	15	43725		56275	88629	421	11371	44904	205	55096	45 45
		Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	°

46½ Deg.

45½ Deg.

44½ Deg.

TABLE V.—LOG. SINES, ETC.

45 Deg.

°	Sine	D.	Cosec.	Tang.	D.	Cot.	Sec.	D.	Cos.	
	9'84		10'1			10'0	10'1		9'8	
44 15	3725	216	56275	9'988629	421	11371	44904	205	55096	45
16	3855	216	56145	9'988882	421	11118	45027	205	54973	44
17	3984	216	56016	9'989134	421	10866	45150	205	54850	43
18	4114	215	55886	9'989387	421	10613	45273	206	54727	42
19	4243	215	55757	9'989640	421	10360	45397	206	54603	41
20	4372	215	55628	9'989893	421	10107	45520	206	54480	40
21	4502	215	55498	9'990145	421	09855	45644	206	54356	39
22	4631	215	55369	9'990398	421	09602	45767	206	54233	38
23	4760	215	55240	9'990651	421	09349	45891	206	54109	45 37
44 24	4889	215	55111	9'990903	421	09097	46014	206	53986	36
25	5018	215	54982	9'991156	421	08844	46138	206	53862	35
26	5147	215	54853	9'991409	421	08591	46262	206	53738	34
27	5276	214	54724	9'991662	421	08338	46386	207	53614	33
28	5405	214	54595	9'991914	421	08086	46510	207	53490	32
29	5533	214	54467	9'992167	421	07833	46634	207	53366	31
30	5662	214	54338	9'992420	421	07580	46758	207	53242	30
31	5790	214	54210	9'992672	421	07328	46882	207	53118	29
32	5919	214	54081	9'992925	421	07075	47006	207	52994	45 28
44 33	6047	214	53953	9'993178	421	06822	47131	207	52869	27
34	6175	214	53825	9'993430	421	06570	47255	207	52745	26
35	6304	213	53696	9'993683	421	06317	47380	207	52620	25
36	6432	213	53568	9'993936	421	06064	47504	208	52496	24
37	6560	213	53440	9'994189	421	05811	47629	208	52371	23
38	6688	213	53312	9'994441	421	05559	47753	208	52247	22
39	6816	213	53184	9'994694	421	05306	47878	208	52122	21
40	6944	213	53056	9'994947	421	05053	48003	208	51997	20
41	7071	213	52929	9'995199	421	04801	48128	208	51873	45 19
44 42	7199	213	52801	9'995452	421	04548	48253	208	51747	18
43	7327	213	52673	9'995705	421	04295	48378	208	51622	17
44	7454	212	52546	9'995957	421	04043	48503	209	51497	16
45	7582	212	52418	9'996210	421	03790	48628	209	51372	15
46	7709	212	52291	9'996463	421	03537	48754	209	51246	14
47	7836	212	52164	9'996715	421	03285	48879	209	51121	13
48	7964	212	52036	9'996968	421	03032	49004	209	50996	12
49	8091	212	51909	9'997221	421	02779	49130	209	50870	11
50	8218	212	51782	9'997473	421	02527	49255	209	50745	45 10
44 51	8345	212	51655	9'997726	421	02274	49381	209	50619	9
52	8472	211	51528	9'997979	421	02021	49507	210	50493	8
53	8599	211	51401	9'998231	421	01769	49632	210	50368	7
54	8726	211	51274	9'998484	421	01516	49758	210	50242	6
55	8852	211	51148	9'998737	421	01263	49884	210	50116	5
56	8979	211	51021	9'998989	421	01011	50010	210	49990	4
57	9106	211	50894	9'999242	421	00758	50136	210	49864	3
58	9232	211	50768	9'999495	421	00505	50262	210	49738	2
59	9359	211	50641	9'999747	421	00253	50389	210	49611	1
60	9485		50515	10.000000		00000	50515		49485	45 0
	Cos.	D.	Sec.	Cot.	D.	Tang.	Cosec.	D.	Sine	

45½ Deg.

45 Deg.

TABLE VI.—MERIDIONAL PARTS.

	25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	41°	42°	43°	44°	45°	
0	1550	1616	1684	1751	1819	1888	1958	2028	2100	2171	2244	2318	2393	2468	2545	2623	2702	2782	2863	2946	3030	0
1	1551	1618	1685	1752	1821	1890	1960	2030	2101	2172	2245	2320	2395	2470	2547	2624	2703	2783	2864	2947	3031	1
2	1552	1619	1686	1753	1822	1891	1961	2031	2102	2173	2246	2321	2396	2471	2548	2625	2704	2784	2865	2948	3032	2
3	1553	1620	1687	1754	1823	1892	1962	2032	2103	2174	2247	2322	2397	2472	2549	2626	2705	2785	2866	2949	3033	3
4	1554	1621	1688	1755	1824	1893	1963	2033	2104	2175	2248	2323	2398	2473	2550	2627	2706	2786	2867	2950	3034	4
5	1555	1622	1689	1756	1825	1894	1964	2034	2105	2176	2249	2324	2399	2474	2551	2628	2707	2787	2868	2951	3035	5
6	1557	1623	1690	1758	1826	1895	1965	2035	2106	2177	2250	2325	2400	2475	2552	2629	2708	2788	2869	2952	3036	6
7	1558	1624	1691	1759	1827	1896	1966	2036	2107	2178	2251	2326	2401	2476	2553	2630	2709	2789	2870	2953	3037	7
8	1559	1625	1693	1760	1829	1898	1967	2037	2108	2179	2252	2327	2402	2477	2554	2631	2710	2790	2871	2954	3038	8
9	1560	1626	1694	1761	1830	1899	1968	2038	2109	2181	2254	2328	2403	2478	2555	2632	2711	2791	2872	2955	3039	9
10	1561	1628	1695	1762	1831	1900	1970	2040	2111	2184	2257	2330	2405	2480	2557	2634	2712	2792	2873	2956	3040	10
11	1562	1629	1696	1764	1832	1901	1971	2041	2112	2185	2258	2331	2406	2481	2558	2635	2713	2793	2874	2957	3041	11
12	1563	1630	1697	1765	1833	1902	1972	2042	2113	2186	2259	2332	2407	2482	2559	2636	2714	2794	2875	2958	3042	12
13	1564	1631	1698	1766	1834	1903	1973	2043	2114	2187	2260	2333	2408	2483	2560	2637	2715	2795	2876	2959	3043	13
14	1565	1632	1699	1767	1835	1904	1974	2044	2115	2188	2261	2334	2409	2484	2561	2638	2716	2796	2877	2960	3044	14
15	1567	1633	1700	1768	1837	1906	1976	2046	2116	2189	2262	2335	2410	2485	2562	2639	2717	2797	2878	2961	3045	15
16	1568	1634	1701	1769	1838	1907	1977	2047	2117	2190	2263	2336	2411	2486	2563	2640	2718	2798	2879	2962	3046	16
17	1569	1635	1703	1770	1839	1908	1978	2048	2118	2191	2264	2337	2412	2487	2564	2641	2719	2799	2880	2963	3047	17
18	1570	1637	1704	1772	1840	1909	1979	2049	2119	2192	2265	2338	2413	2488	2565	2642	2720	2800	2881	2964	3048	18
19	1571	1638	1705	1773	1841	1910	1980	2050	2121	2193	2266	2339	2414	2489	2566	2643	2721	2801	2882	2965	3049	19
20	1572	1639	1706	1774	1842	1912	1981	2051	2122	2194	2267	2340	2415	2490	2567	2644	2722	2802	2883	2966	3050	20
21	1573	1640	1707	1775	1843	1913	1982	2052	2123	2195	2268	2341	2416	2491	2568	2645	2723	2803	2884	2967	3051	21
22	1574	1641	1708	1776	1844	1914	1983	2053	2124	2196	2269	2342	2417	2492	2569	2646	2724	2804	2885	2968	3052	22
23	1575	1642	1709	1777	1845	1915	1984	2054	2125	2197	2270	2343	2418	2493	2570	2647	2725	2805	2886	2969	3053	23
24	1577	1643	1711	1778	1847	1916	1985	2055	2126	2198	2271	2344	2419	2494	2571	2648	2726	2806	2887	2970	3054	24
25	1578	1644	1712	1780	1848	1917	1986	2056	2127	2199	2272	2345	2420	2495	2572	2649	2727	2807	2888	2971	3055	25
26	1579	1645	1713	1781	1849	1918	1987	2057	2128	2200	2273	2346	2421	2496	2573	2650	2728	2808	2889	2972	3056	26
27	1580	1647	1714	1782	1850	1919	1988	2058	2129	2201	2274	2347	2422	2497	2574	2651	2729	2809	2890	2973	3057	27
28	1581	1648	1715	1783	1851	1921	1990	2060	2131	2202	2275	2348	2423	2498	2575	2652	2730	2810	2891	2974	3058	28
29	1582	1649	1716	1784	1853	1922	1991	2061	2132	2203	2276	2349	2424	2499	2576	2653	2731	2811	2892	2975	3059	29

TABLE VI.—MERIDIONAL PARTS.

25°	26°	27°	28°	29°	30°	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	41°	42°	43°	44°	45°	°	
30	1583	1650	1717	1785	1854	1923	1993	2064	2135	2208	2281	2355	2430	2506	2584	2662	2742	2822	2904	2988	3073	30
31	1584	1651	1718	1786	1855	1924	1994	2065	2137	2209	2282	2356	2432	2508	2585	2663	2743	2824	2906	2990	3074	31
32	1585	1652	1720	1787	1856	1925	1995	2066	2138	2210	2283	2358	2433	2509	2586	2665	2744	2825	2907	2991	3075	32
33	1586	1653	1721	1789	1857	1926	1996	2067	2139	2211	2285	2359	2434	2510	2587	2666	2746	2826	2908	2992	3077	33
34	1588	1654	1722	1790	1858	1927	1997	2068	2140	2212	2286	2360	2435	2512	2589	2667	2747	2828	2910	2993	3078	34
35	1589	1656	1723	1791	1860	1929	1999	2070	2141	2214	2287	2361	2437	2513	2590	2668	2748	2829	2911	2995	3080	35
36	1590	1657	1724	1792	1861	1930	2000	2071	2142	2215	2288	2362	2438	2514	2591	2669	2749	2830	2912	2996	3081	36
37	1591	1658	1725	1793	1862	1931	2001	2072	2143	2216	2290	2364	2440	2516	2593	2671	2751	2832	2914	2998	3083	37
38	1592	1659	1726	1794	1863	1932	2002	2073	2144	2217	2291	2365	2440	2517	2594	2673	2752	2833	2915	2999	3084	38
39	1593	1660	1727	1795	1864	1933	2003	2074	2145	2218	2292	2366	2441	2518	2595	2674	2753	2834	2916	3000	3085	39
40	1594	1661	1729	1797	1865	1934	2004	2075	2146	2219	2293	2367	2442	2519	2596	2675	2754	2835	2917	3001	3086	40
41	1595	1662	1730	1798	1866	1935	2005	2076	2147	2220	2294	2368	2443	2520	2597	2676	2755	2836	2918	3002	3087	41
42	1596	1663	1731	1799	1867	1936	2006	2077	2148	2221	2295	2369	2444	2521	2598	2677	2756	2837	2919	3003	3088	42
43	1598	1664	1732	1800	1869	1938	2008	2079	2150	2223	2296	2370	2445	2522	2599	2678	2757	2838	2920	3004	3089	43
44	1599	1666	1733	1801	1870	1939	2009	2080	2151	2224	2297	2371	2446	2523	2601	2679	2758	2839	2921	3005	3090	44
45	1600	1667	1734	1802	1871	1941	2011	2082	2153	2226	2299	2372	2447	2524	2602	2680	2759	2840	2922	3006	3091	45
46	1601	1668	1735	1803	1872	1942	2012	2083	2154	2227	2301	2374	2449	2526	2603	2681	2760	2841	2923	3007	3092	46
47	1602	1669	1736	1804	1873	1943	2013	2084	2155	2228	2302	2375	2450	2527	2604	2682	2762	2843	2925	3009	3094	47
48	1603	1670	1737	1805	1874	1944	2014	2085	2156	2230	2303	2376	2451	2528	2605	2683	2764	2845	2926	3010	3095	48
49	1604	1671	1739	1807	1876	1945	2015	2086	2157	2231	2304	2377	2452	2529	2606	2684	2765	2846	2927	3011	3096	49
50	1605	1672	1740	1808	1877	1946	2016	2087	2158	2232	2305	2378	2453	2530	2607	2685	2766	2847	2928	3012	3097	50
51	1606	1673	1741	1809	1878	1947	2017	2088	2159	2233	2306	2379	2454	2531	2608	2686	2767	2848	2929	3013	3098	51
52	1608	1675	1742	1810	1879	1948	2018	2089	2160	2234	2307	2380	2455	2532	2610	2687	2768	2849	2930	3014	3099	52
53	1609	1676	1743	1811	1880	1950	2020	2091	2162	2235	2308	2381	2456	2533	2611	2688	2769	2850	2931	3015	3100	53
54	1610	1677	1744	1812	1881	1951	2021	2092	2163	2236	2309	2382	2457	2534	2612	2689	2770	2851	2932	3016	3101	54
55	1611	1678	1745	1813	1882	1952	2022	2093	2164	2237	2310	2383	2458	2535	2613	2690	2771	2852	2933	3017	3102	55
56	1612	1679	1746	1814	1883	1953	2023	2094	2165	2238	2311	2384	2459	2536	2614	2691	2772	2853	2934	3018	3103	56
57	1613	1680	1747	1815	1884	1954	2024	2095	2166	2239	2312	2385	2460	2537	2615	2692	2773	2854	2935	3019	3104	57
58	1614	1681	1748	1816	1885	1955	2025	2096	2167	2240	2313	2386	2461	2538	2616	2693	2774	2855	2936	3020	3105	58
59	1615	1682	1749	1817	1886	1956	2026	2097	2168	2241	2314	2387	2462	2539	2617	2694	2775	2856	2937	3021	3106	59
60	1616	1683	1750	1818	1887	1957	2027	2098	2169	2242	2315	2388	2463	2540	2618	2695	2776	2857	2938	3022	3107	60

1	5520	5585	5851	6025	6208	6371	6535	6700	6864	7028	7192	7356	7520	7684	7848	8012	8176	8340	8504	8668	8832	8996	9160	9324	9488	9652	9816	9980	10144	10308	10472	10636	10800	10964	11128	11292	11456	11620	11784	11948	12112	12276	12440	12604	12768	12932	13096	13260	13424	13588	13752	13916	14080	14244	14408	14572	14736	14900	15064	15228	15392	15556	15720	15884	16048	16212	16376	16540	16704	16868	17032	17196	17360	17524	17688	17852	18016	18180	18344	18508	18672	18836	19000	19164	19328	19492	19656	19820	19984	20148	20312	20476	20640	20804	20968	21132	21296	21460	21624	21788	21952	22116	22280	22444	22608	22772	22936	23100	23264	23428	23592	23756	23920	24084	24248	24412	24576	24740	24904	25068	25232	25396	25560	25724	25888	26052	26216	26380	26544	26708	26872	27036	27200	27364	27528	27692	27856	28020	28184	28348	28512	28676	28840	29004	29168	29332	29496	29660	29824	29988	30152	30316	30480	30644	30808	30972	31136	31300	31464	31628	31792	31956	32120	32284	32448	32612	32776	32940	33104	33268	33432	33596	33760	33924	34088	34252	34416	34580	34744	34908	35072	35236	35400	35564	35728	35892	36056	36220	36384	36548	36712	36876	37040	37204	37368	37532	37696	37860	38024	38188	38352	38516	38680	38844	39008	39172	39336	39500	39664	39828	39992	40156	40320	40484	40648	40812	40976	41140	41304	41468	41632	41796	41960	42124	42288	42452	42616	42780	42944	43108	43272	43436	43600	43764	43928	44092	44256	44420	44584	44748	44912	45076	45240	45404	45568	45732	45896	46060	46224	46388	46552	46716	46880	47044	47208	47372	47536	47700	47864	48028	48192	48356	48520	48684	48848	49012	49176	49340	49504	49668	49832	49996	50160	50324	50488	50652	50816	50980	51144	51308	51472	51636	51800	51964	52128	52292	52456	52620	52784	52948	53112	53276	53440	53604	53768	53932	54096	54260	54424	54588	54752	54916	55080	55244	55408	55572	55736	55900	56064	56228	56392	56556	56720	56884	57048	57212	57376	57540	57704	57868	58032	58196	58360	58524	58688	58852	59016	59180	59344	59508	59672	59836	60000	60164	60328	60492	60656	60820	60984	61148	61312	61476	61640	61804	61968	62132	62296	62460	62624	62788	62952	63116	63280	63444	63608	63772	63936	64100	64264	64428	64592	64756	64920	65084	65248	65412	65576	65740	65904	66068	66232	66396	66560	66724	66888	67052	67216	67380	67544	67708	67872	68036	68200	68364	68528	68692	68856	69020	69184	69348	69512	69676	69840	70004	70168	70332	70496	70660	70824	70988	71152	71316	71480	71644	71808	71972	72136	72300	72464	72628	72792	72956	73120	73284	73448	73612	73776	73940	74104	74268	74432	74596	74760	74924	75088	75252	75416	75580	75744	75908	76072	76236	76400	76564	76728	76892	77056	77220	77384	77548	77712	77876	78040	78204	78368	78532	78696	78860	79024	79188	79352	79516	79680	79844	80008	80172	80336	80500	80664	80828	80992	81156	81320	81484	81648	81812	81976	82140	82304	82468	82632	82796	82960	83124	83288	83452	83616	83780	83944	84108	84272	84436	84600	84764	84928	85092	85256	85420	85584	85748	85912	86076	86240	86404	86568	86732	86896	87060	87224	87388	87552	87716	87880	88044	88208	88372	88536	88700	88864	89028	89192	89356	89520	89684	89848	90012	90176	90340	90504	90668	90832	90996	91160	91324	91488	91652	91816	91980	92144	92308	92472	92636	92800	92964	93128	93292	93456	93620	93784	93948	94112	94276	94440	94604	94768	94932	95096	95260	95424	95588	95752	95916	96080	96244	96408	96572	96736	96900	97064	97228	97392	97556	97720	97884	98048	98212	98376	98540	98704	98868	99032	99196	99360	99524	99688	99852	100016	100180	100344	100508	100672	100836	100999	101163	101327	101491	101655	101819	101983	102147	102311	102475	102639	102803	102967	103131	103295	103459	103623	103787	103951	104115	104279	104443	104607	104771	104935	105099	105263	105427	105591	105755	105919	106083	106247	106411	106575	106739	106903	107067	107231	107395	107559	107723	107887	108051	108215	108379	108543	108707	108871	109035	109199	109363	109527	109691	109855	110019	110183	110347	110511	110675	110839	110999	111163	111327	111491	111655	111819	111983	112147	112311	112475	112639	112803	112967	113131	113295	113459	113623	113787	113951	114115	114279	114443	114607	114771	114935	115099	115263	115427	115591	115755	115919	116083	116247	116411	116575	116739	116903	117067	117231	117395	117559	117723	117887	118051	118215	118379	118543	118707	118871	119035	119199	119363	119527	119691	119855	120019	120183	120347	120511	120675	120839	120999	121163	121327	121491	121655	121819	121983	122147	122311	122475	122639	122803	122967	123131	123295	123459	123623	123787	123951	124115	124279	124443	124607	124771	124935	125099	125263	125427	125591	125755	125919	126083	126247	126411	126575	126739	126903	127067	127231	127395	127559	127723	127887	128051	128215	128379	128543	128707	128871	129035	129199	129363	129527	129691	129855	130019	130183	130347	130511	130675	130839	130999	131163	131327	131491	131655	131819	131983	132147	132311	132475	132639	132803	132967	133131	133295	133459	133623	133787	133951	134115	134279	134443	134607	134771	134935	135099	135263	135427	135591	135755	135919	136083	136247	136411	136575	136739	136903	137067	137231	137395	137559	137723	137887	138051	138215	138379	138543	138707	138871	139035	139199	139363	139527	139691	139855	140019	140183	140347	140511	140675	140839	140999	141163	141327	141491	141655	141819	141983	142147	142311	142475	142639	142803	142967	143131	143295	143459	143623	143787	143951	144115	144279	144443	144607	144771	144935	145099	145263	145427	145591	145755	145919	146083	146247	146411	146575	146739	146903	147067	147231	147395	147559	147723	147887	148051	148215	148379	148543	148707	148871	149035	149199	149363	149527	149691	149855	150019	150183	150347	150511	150675	150839	150999	151163	151327	151491	151655	151819	151983	152147	152311	152475	152639	152803	152967	153131	153295	153459	153623	153787	153951	154115	154279	154443	154607	154771	154935	155099	155263	155427	155591	155755	155919	156083	156247	156411	156575	156739	156903	157067	157231	157395	157559	157723	157887	158051	158215	158379	158543	158707	158871	159035	159199	159363	159527	159691	159855	160019	160183	160347	160511	160675	160839	160999	161163	161327	161491	161655	161819	161983	162147	162311	162475	162639	162803	162967	163131	163295	163459	163623	163787	163951	164115	164279	164443	164607	164771	164935	165099	165263	165427	165591	165755	165919	166083	166247	166411	166575	166739	166903	167067	167231	167395	167559	167723	167887	168051	168215	168379	168543	168707	168871	169035	169199	169363	169527	169691	169855	170019	170183	170347	170511	170675	170839	170999	171163	171327	171491	171655	171819	171983	172147	172311	172475	172639	172803	172967	173131	173295	173459	173623	173787	173951	174115	174279	174443	174607	174771	174935	175099	175263	175427	175591	175755	175919	176083	176247	176411	176575	176739	176903	177067	177231	177395	177559	177723	177887	178051	178215	178379	178543	178707	178871	179035	179199	179363	179527	179691	179855	180019	180183	180347	180511	180675	180839	180999	181163	181327	181491	181655	181819	181983	182147	182311	182475	182639	182803	182967	183131	183295	183459	183623	183787	183951	184115	184279	184443	184607	184771	184935	185099	185263	185427	185591	185755	185919	186083	186247	186411	186575	186739	186903	187067	187231	187395	187559	187723	187887	188051	188215	188379	188543	188707	188871	189035	189199	189363	189527	189691	189855	190019	190183	190347	190511	190675	190839	190999	191163	191327	191491	191655	191819	191983	192147	192311	192475	192639	192803	192967	193131	193295	193459	193623	193787	193951	194115	194279	194443	194607	194771	194935	195099	195263	195427	195591	195755	195919	196083	196247	196411	196575	196739	196903	197067	197231	197395	197559	197723	197887	198051	198215	198379	198543	198707	198871</
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TABLE VI.—MERIDIONAL PARTS.

λ	6°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	81°	82°	83°	84°	85°	λ
30	5552	5712	5879	6055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	10437	11127	30
31	5554	5715	5882	6058	6242	6437	6643	6860	7092	7341	7608	7897	8212	8558	8943	9376	9870	10447	11140	31
32	5557	5717	5885	6061	6245	6440	6646	6864	7096	7345	7612	7902	8218	8565	8950	9383	9879	10457	11153	32
33	5559	5720	5888	6064	6249	6443	6649	6868	7100	7349	7617	7907	8223	8571	8957	9391	9888	10468	11166	33
34	5562	5723	5891	6067	6252	6447	6653	6871	7104	7353	7622	7912	8229	8577	8963	9399	9897	10479	11179	34
35	5565	5725	5894	6070	6255	6450	6656	6875	7108	7358	7626	7917	8234	8583	8970	9407	9906	10489	11192	35
36	5567	5728	5896	6073	6258	6453	6660	6879	7112	7362	7631	7922	8240	8589	8977	9414	9915	10500	11205	36
37	5570	5731	5899	6076	6261	6457	6663	6882	7116	7366	7636	7927	8245	8595	8984	9422	9924	10510	11218	37
38	5573	5734	5902	6079	6264	6460	6667	6886	7120	7371	7640	7932	8251	8601	8991	9430	9933	10521	11231	38
39	5575	5736	5905	6082	6268	6463	6670	6890	7124	7375	7645	7937	8256	8607	8998	9438	9942	10532	11244	39
40	5578	5739	5908	6085	6271	6467	6674	6894	7128	7379	7650	7942	8262	8614	9005	9445	9951	10542	11257	40
41	5580	5742	5911	6088	6274	6470	6677	6898	7132	7384	7654	7948	8267	8620	9012	9453	9960	10553	11270	41
42	5583	5745	5914	6091	6277	6473	6681	6901	7136	7388	7659	7953	8273	8626	9018	9461	9969	10564	11284	42
43	5586	5747	5917	6094	6280	6477	6685	6905	7140	7392	7664	7958	8279	8632	9025	9469	9978	10575	11297	43
44	5588	5750	5919	6097	6283	6480	6688	6909	7145	7397	7668	7963	8284	8638	9032	9477	9987	10586	11310	44
45	5591	5753	5922	6100	6287	6483	6692	6913	7149	7401	7673	7968	8290	8644	9039	9485	9996	10597	11324	45
46	5594	5756	5925	6103	6290	6487	6695	6917	7153	7406	7678	7973	8295	8651	9046	9493	10005	10608	11337	46
47	5597	5758	5928	6106	6293	6490	6699	6920	7157	7410	7683	7978	8301	8657	9053	9501	10015	10619	11351	47
48	5599	5761	5931	6109	6296	6494	6702	6924	7161	7414	7687	7983	8307	8663	9060	9509	10024	10630	11365	48
49	5602	5764	5934	6112	6299	6497	6706	6928	7165	7419	7692	7989	8312	8669	9067	9517	10033	10641	11378	49
50	5604	5767	5937	6115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	9074	9525	10043	10652	11392	50
51	5607	5770	5940	6118	6306	6504	6713	6936	7173	7427	7702	7999	8324	8682	9081	9533	10052	10663	11406	51
52	5610	5772	5943	6121	6309	6507	6717	6940	7177	7432	7706	8004	8329	8688	9088	9541	10061	10674	11420	52
53	5612	5775	5946	6124	6312	6511	6720	6943	7181	7437	7711	8009	8335	8695	9096	9549	10071	10685	11434	53
54	5615	5778	5948	6127	6315	6514	6724	6947	7185	7441	7716	8014	8341	8701	9103	9557	10080	10696	11448	54
55	5617	5781	5951	6130	6319	6517	6728	6951	7189	7445	7721	8020	8347	8707	9110	9565	10089	10708	11462	55
56	5620	5783	5954	6133	6322	6521	6731	6955	7194	7449	7725	8025	8352	8714	9117	9573	10099	10719	11476	56
57	5623	5786	5957	6136	6325	6524	6735	6959	7198	7454	7730	8030	8358	8720	9124	9581	10108	10730	11490	57
58	5625	5789	5960	6140	6328	6528	6738	6963	7202	7458	7735	8035	8364	8726	9131	9589	10118	10742	11504	58
59	5628	5792	5963	6143	6332	6531	6742	6966	7206	7463	7740	8040	8369	8733	9138	9598	10127	10753	11518	59

TABLE VI.—MERIDIONAL PARTS.

	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	81°	82°	83°	84°	85°	'
0	5474	5631	5795	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	8739	9145	9606	10137	10765	0
1	5477	5633	5797	5969	6149	6338	6538	6749	6974	7214	7472	7750	8051	8381	8745	9153	9614	10146	10776	1
2	5479	5636	5800	5972	6152	6341	6541	6753	6978	7218	7476	7754	8056	8387	8752	9160	9622	10156	10788	2
3	5482	5639	5803	5975	6155	6345	6545	6757	6982	7222	7481	7759	8061	8393	8758	9167	9631	10166	10799	3
4	5484	5642	5806	5978	6158	6348	6548	6760	6986	7226	7485	7764	8067	8399	8764	9173	9639	10175	10811	4
5	5487	5644	5809	5981	6161	6351	6552	6764	6990	7231	7490	7769	8072	8404	8771	9180	9647	10185	10822	5
6	5489	5647	5811	5984	6164	6354	6555	6768	6994	7235	7494	7774	8077	8410	8778	9189	9655	10195	10834	6
7	5492	5650	5814	5988	6167	6358	6559	6771	6997	7239	7498	7778	8083	8416	8784	9196	9664	10205	10846	7
8	5495	5652	5817	5991	6170	6361	6562	6775	7001	7243	7503	7783	8088	8422	8791	9203	9672	10214	10858	8
9	5497	5655	5820	5994	6173	6364	6565	6779	7005	7247	7507	7788	8093	8427	8797	9211	9680	10224	10869	9
10	5500	5658	5823	5998	6177	6367	6569	6782	7009	7252	7512	7793	8099	8433	8804	9218	9689	10234	10881	10
11	5502	5660	5825	5999	6180	6371	6572	6786	7013	7256	7516	7798	8104	8439	8810	9225	9697	10244	10893	11
12	5505	5663	5828	6001	6183	6374	6576	6790	7017	7260	7521	7803	8109	8445	8817	9233	9706	10254	10905	12
13	5507	5666	5831	6004	6186	6377	6579	6793	7021	7264	7525	7808	8115	8451	8823	9240	9714	10264	10917	13
14	5510	5668	5834	6007	6189	6380	6583	6797	7025	7268	7530	7813	8120	8457	8830	9248	9723	10273	10929	14
15	5513	5671	5837	6010	6192	6384	6586	6801	7029	7273	7535	7817	8125	8463	8836	9255	9731	10283	10941	15
16	5515	5674	5839	6013	6195	6387	6590	6804	7033	7277	7539	7822	8131	8469	8843	9262	9740	10293	10953	16
17	5518	5676	5842	6016	6198	6390	6593	6808	7037	7281	7544	7827	8136	8474	8849	9270	9748	10303	10965	17
18	5520	5679	5845	6019	6201	6394	6597	6812	7041	7285	7548	7832	8141	8480	8856	9277	9757	10314	10978	18
19	5523	5682	5848	6022	6205	6397	6600	6815	7045	7289	7553	7837	8147	8486	8863	9285	9765	10324	10990	19
20	5526	5685	5851	6025	6208	6400	6603	6819	7048	7294	7557	7842	8152	8493	8869	9292	9774	10334	11002	20
21	5528	5687	5854	6028	6211	6403	6607	6823	7052	7298	7562	7847	8158	8498	8876	9300	9783	10344	11014	21
22	5531	5690	5856	6031	6214	6407	6610	6826	7056	7302	7566	7851	8163	8504	8883	9307	9791	10354	11027	22
23	5533	5693	5859	6034	6217	6410	6614	6830	7060	7306	7571	7857	8168	8510	8890	9315	9800	10364	11039	23
24	5536	5695	5862	6037	6220	6413	6617	6834	7064	7311	7576	7862	8174	8516	8896	9322	9809	10374	11052	24
25	5539	5698	5865	6040	6223	6417	6621	6838	7068	7315	7580	7867	8179	8522	8903	9330	9817	10385	11064	25
26	5541	5701	5868	6043	6226	6420	6624	6841	7072	7319	7585	7872	8185	8528	8909	9337	9826	10395	11077	26
27	5544	5704	5871	6046	6230	6423	6628	6845	7076	7323	7589	7877	8190	8534	8916	9345	9835	10405	11089	27
28	5546	5706	5874	6049	6233	6427	6631	6849	7080	7328	7594	7882	8196	8540	8923	9353	9844	10416	11102	28
29	5549	5709	5877	6052	6236	6430	6635	6853	7084	7332	7599	7887	8201	8546	8930	9360	9852	10426	11115	29

TABLE VI.—MERIDIONAL PARTS.

°	63°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
30	5552	5712	5879	6055	6239	6433	6639	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	10437	11127	11927	12837	13857	14987	16327
31	5554	5715	5882	6058	6242	6437	6642	6860	7092	7341	7608	7897	8212	8558	8943	9376	9870	10447	11140	11940	12850	13870	14999	16339
32	5557	5718	5885	6061	6245	6440	6646	6864	7096	7345	7612	7902	8218	8565	8950	9383	9877	10454	11147	11947	12857	13877	14999	16339
33	5559	5720	5888	6064	6249	6444	6649	6867	7100	7349	7617	7907	8223	8571	8957	9391	9885	10462	11155	11955	12865	13885	14999	16339
34	5562	5723	5891	6067	6252	6447	6653	6871	7104	7353	7622	7912	8228	8577	8963	9397	9891	10468	11161	11961	12871	13891	14999	16339
35	5565	5725	5894	6070	6255	6450	6656	6875	7108	7357	7626	7916	8232	8581	8967	9401	9895	10472	11165	11965	12875	13895	14999	16339
36	5567	5728	5896	6073	6258	6453	6660	6879	7112	7361	7630	7920	8236	8585	8971	9405	9899	10476	11169	11969	12879	13899	14999	16339
37	5570	5731	5899	6076	6261	6457	6664	6883	7116	7365	7634	7924	8240	8589	8975	9409	9903	10480	11173	11973	12883	13903	14999	16339
38	5573	5734	5902	6079	6264	6460	6667	6886	7120	7371	7640	7930	8246	8595	8981	9413	9907	10484	11177	11977	12887	13907	14999	16339
39	5575	5736	5905	6082	6268	6463	6670	6889	7124	7375	7645	7935	8251	8600	8986	9417	9911	10488	11181	11981	12891	13911	14999	16339
40	5578	5739	5908	6085	6271	6467	6674	6894	7128	7379	7650	7940	8256	8605	9005	9419	9913	10492	11185	11985	12895	13915	14999	16339
41	5580	5742	5911	6088	6274	6470	6677	6898	7132	7383	7654	7944	8260	8610	9010	9423	9917	10496	11189	11989	12899	13919	14999	16339
42	5583	5745	5914	6091	6277	6473	6681	6901	7136	7388	7659	7949	8265	8615	9015	9429	9923	10500	11193	11993	12903	13923	14999	16339
43	5586	5747	5917	6094	6280	6477	6685	6905	7140	7391	7662	7952	8268	8618	9018	9433	9927	10504	11197	11997	12907	13927	14999	16339
44	5588	5750	5919	6097	6283	6480	6688	6909	7145	7397	7668	7958	8274	8624	9024	9437	9931	10508	11201	12001	12911	13931	14999	16339
45	5591	5753	5922	6100	6287	6483	6692	6913	7149	7401	7672	7962	8278	8628	9028	9441	9935	10512	11205	12005	12915	13935	14999	16339
46	5594	5756	5925	6103	6290	6487	6695	6917	7153	7406	7677	7967	8283	8633	9033	9445	9939	10516	11209	12009	12919	13939	14999	16339
47	5596	5758	5928	6106	6293	6490	6699	6921	7157	7410	7681	7971	8287	8637	9037	9449	9943	10520	11213	12013	12923	13943	14999	16339
48	5599	5761	5931	6109	6296	6494	6702	6924	7161	7414	7685	7975	8291	8641	9041	9453	9947	10524	11217	12017	12927	13947	14999	16339
49	5602	5764	5934	6112	6299	6497	6706	6928	7165	7419	7690	7980	8296	8646	9046	9457	9951	10528	11221	12021	12931	13951	14999	16339
50	5604	5767	5937	6115	6303	6500	6710	6932	7169	7423	7697	7994	8310	8660	9060	9463	9955	10532	11225	12025	12935	13955	14999	16339
51	5607	5770	5940	6118	6306	6504	6714	6936	7173	7427	7702	7999	8315	8665	9065	9467	9959	10536	11229	12029	12939	13959	14999	16339
52	5610	5772	5943	6121	6309	6507	6717	6940	7177	7431	7706	8004	8320	8670	9070	9471	9963	10540	11233	12033	12943	13963	14999	16339
53	5612	5775	5946	6124	6312	6511	6720	6943	7181	7435	7711	8009	8325	8675	9075	9475	9967	10544	11237	12037	12947	13967	14999	16339
54	5615	5778	5948	6127	6315	6514	6724	6947	7185	7441	7716	8014	8330	8680	9080	9479	9971	10548	11241	12041	12951	13971	14999	16339
55	5617	5781	5951	6130	6319	6517	6728	6951	7189	7445	7721	8020	8336	8686	9086	9483	9975	10552	11245	12045	12955	13975	14999	16339
56	5620	5783	5954	6133	6322	6521	6731	6955	7194	7449	7725	8024	8340	8690	9090	9487	9979	10556	11249	12049	12959	13979	14999	16339
57	5623	5786	5957	6136	6325	6524	6735	6959	7198	7454	7730	8030	8346	8696	9096	9491	9983	10560	11253	12053	12963	13983	14999	16339
58	5625	5789	5960	6140	6328	6528	6739	6963	7202	7458	7735	8035	8351	8701	9101	9495	9987	10564	11257	12057	12967	13987	14999	16339
59	5628	5792	5963	6143	6332	6531	6742	6966	7206	7463	7740	8040	8356	8706	9106	9499	9991	10568	11261	12061	12971	13991	14999	16339

TABLE XI.
AUGMENTATION OF THE MOON'S
SEMIDIAMETER.

Altitude.	HORIZONTAL SEMIDIAMETER.					
	14 30	15 0	15 30	16 0	16 30	17 0
0	"	"	"	"	"	"
0	0	0	0	0	0	0
2	1	1	1	1	1	1
4	1	1	1	1	1	1
6	2	2	2	2	2	2
8	2	2	2	2	3	3
10	2	3	3	3	3	3
12	3	3	3	4	4	4
14	3	4	4	4	4	5
16	4	4	4	5	5	5
18	4	5	5	5	6	6
21	5	5	6	6	6	7
24	6	6	6	7	7	8
27	6	7	7	8	8	9
30	7	7	8	8	9	9
33	7	8	9	9	10	10
36	8	9	9	10	10	11
39	9	9	10	11	11	12
42	9	10	10	11	12	13
45	10	10	11	12	13	13
48	10	11	12	12	13	14
51	11	11	12	13	14	15
54	11	12	13	13	14	15
57	11	12	13	14	15	16
60	12	13	14	14	15	16
63	12	13	14	15	16	17
66	12	13	14	15	16	17
69	13	14	15	16	17	18
72	13	14	15	16	17	18
75	13	14	15	16	17	18
78	13	14	15	16	17	18
81	14	14	15	16	18	19
84	14	15	16	17	18	19
87	14	15	16	17	18	19
90	14	15	16	17	18	19

TABLE XII.
FOR CONVERTING LONGITUDE
INTO TIME.

Long.	Time.	Long.	Time.	Long.	Time.
°	H. M. S.	°	H. M. S.	"	Secs.
1	0 4	30	2 0	1	067
2	0 8	40	2 40	2	133
3	0 12	50	3 20	3	200
4	0 16	60	4 0	4	267
5	0 20	70	4 40	5	333
6	0 24	80	5 20	6	400
7	0 28	90	6 0	7	467
8	0 32	100	6 40	8	533
9	0 36	200	13 20	9	600
10	0 40	300	20 0	10	667
20	1 20				

TABLE XIII.
FOR CONVERTING TIME INTO
LONGITUDE.

Time.	Long.	Time.	Long.	Time.	Long.
H.	°	Min. Sec.	° ' "	Sec.	"
1	15	1	0 15	0.1	1.5
2	30	2	0 30	0.2	3.0
3	45	3	0 45	0.3	4.5
4	60	4	1 0	0.4	6.0
5	75	5	1 15	0.5	7.5
6	90	6	1 30	0.6	9.0
7	105	7	1 45	0.7	10.5
8	120	8	2 0	0.8	12.0
9	135	9	2 15	0.9	13.5
10	150	10	2 30		
11	165	20	5 0		
12	180	30	7 30		
16	240	40	10 0		
20	300	50	12 30		

TABLE XIV.

[illegible]

TABLE XIV.

PARALLAX IN ALTITUDE OF THE SUN AND PLANETS.

[illegible]

TABLE XVI.—CORRECTION FOR TABLE OF REFRACTION.

Apparent altitude.		HEIGHT OF THE THERMOMETER.															
		20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
		+	+	+	+	+	+	+	+	—	—	—	—	—	—	—	—
1	0	59	43	25	1	9	53	38	23	8	7	21	36	50	1	3	1
10	1	53	38	21	6	50	36	22	7	20	34	48	1	0	1	13	1
20	1	48	33	17	3	48	34	21	7	6	19	32	45	0	57	1	9
30	1	43	29	14	0	46	32	20	7	6	18	31	43	0	54	1	6
40	1	39	25	11	0	57	44	31	18	6	6	18	30	41	0	52	1
50	1	35	21	8	0	55	42	30	17	6	6	17	28	39	0	50	1
2	0	31	18	5	0	53	39	29	17	6	5	16	27	37	0	48	0
20	1	23	11	0	0	48	37	26	16	5	5	15	25	35	0	44	0
40	1	17	6	0	55	44	34	24	14	5	5	14	23	32	0	41	0
3	0	11	1	0	51	41	32	22	13	4	4	13	21	30	0	38	0
20	1	6	0	57	0	47	38	29	21	13	4	12	20	28	0	35	0
40	1	2	0	53	0	44	36	28	20	12	4	11	18	26	0	33	0
4	0	58	49	0	41	33	26	18	11	4	4	10	17	24	0	31	0
20	0	54	46	0	39	31	24	17	10	3	3	10	16	22	0	30	0
40	0	51	43	0	37	29	23	16	10	3	3	9	15	21	0	28	0
5	0	48	41	0	35	28	22	16	9	3	3	9	14	20	0	26	0
30	0	45	38	0	32	26	20	14	9	3	3	8	13	19	0	24	0
6	0	41	35	0	30	24	19	13	8	3	2	7	12	17	0	22	0
30	0	38	33	0	28	22	17	12	7	2	2	7	11	15	0	20	0
7	0	36	31	0	26	21	16	12	7	2	2	6	10	14	0	19	0
30	0	34	29	0	24	20	15	11	6	2	2	6	9	13	0	17	0
8	0	32	27	0	23	19	15	10	6	2	2	5	9	13	0	16	0
9	0	28	24	0	20	16	13	9	5	2	2	5	8	11	0	14	0
10	0	26	22	0	18	15	12	8	5	2	2	4	7	10	0	13	0
11	0	23	20	0	17	14	11	8	5	2	1	4	7	9	0	12	0
12	0	21	18	0	15	13	10	7	4	1	1	4	6	9	0	11	0
13	0	20	17	0	14	12	9	7	4	1	1	3	6	8	0	10	0
14	0	18	16	0	13	11	8	6	4	1	1	3	5	7	0	9	0
15	0	17	15	0	12	10	8	6	3	1	1	3	5	7	0	9	0
16	0	16	14	0	12	9	7	5	3	1	1	3	5	6	0	8	0
17	0	15	13	0	11	9	7	5	3	1	1	3	4	6	0	8	0
18	0	14	12	0	10	8	6	5	3	1	1	2	4	6	0	7	0
19	0	13	11	0	9	8	6	4	3	1	1	2	4	5	0	7	0
20	0	13	11	0	9	7	6	4	2	1	1	2	4	5	0	6	0
22	0	11	10	0	8	7	5	4	2	1	1	2	3	5	0	6	0
24	0	10	9	0	7	6	5	3	2	1	1	2	3	4	0	5	0
26	0	9	8	0	7	6	4	3	2	1	1	2	3	4	0	5	0
28	0	9	7	0	6	5	4	3	2	1	1	2	3	4	0	5	0
30	0	8	7	0	6	5	4	3	2	1	1	2	3	4	0	5	0
35	0	7	6	0	5	4	3	2	1	1	1	2	3	4	0	4	0
40	0	6	5	0	4	3	3	2	1	1	1	2	2	3	0	3	0
45	0	5	4	0	3	3	2	2	1	1	1	2	2	3	0	3	0
50	0	4	3	0	3	2	2	1	1	1	1	2	2	2	0	2	0
55	0	3	3	0	2	2	2	1	1	1	1	2	2	2	0	2	0
60	0	3	2	0	2	2	1	1	1	1	1	2	2	2	0	2	0
65	0	2	2	0	2	1	1	1	1	1	1	2	2	2	0	2	0
70	0	2	1	0	1	1	1	1	1	1	1	2	2	2	0	1	0
80	0	1	1	0	1	0	0	0	0	0	0	2	2	2	0	1	0

Height of	28-26	28-56	28-85	29-15	29-45	29-75	30-05	30-35	30-64	30-93	The barometer.
	—	—	—	—	—	+	+	+	+	+	

HEIGHT
OF

— 28-26

— 28-56

— 28-85

— 29-15

— 29-45

— 29-75

+ 30-05

+ 30-35

+ 30-64

+ 30-93

+ THE
THERMOMETER
TYPE.

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

Moon's APP. ALT.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.
	54'	55'	56'	57'	58'	59'	60'	61'			
0	35 36	36 36	37 36	38 36	39 36	40 36	41 36	42 36			
1	36 22	37 22	38 22	39 22	40 22	41 22	42 22	43 22			
2	37 4	38 4	39 4	40 4	41 4	42 4	43 4	44 4	1 1'0		
3	37 44	38 44	39 44	40 44	41 44	42 44	43 44	44 44	2 2'0		
4	38 20	39 20	40 20	41 20	42 20	43 20	44 20	45 20	3 3'0		
5	38 55	39 55	40 55	41 55	42 55	43 55	44 55	45 55	4 4'0		
6	39 28	40 27	41 27	42 27	43 27	44 27	45 27	46 27	5 5'0		
7	39 58	40 58	41 58	42 58	43 58	44 58	45 58	46 58	6 6'0		
8	40 26	41 26	42 26	43 25	44 25	45 25	46 25	47 25	7 7'0		
9	40 53	41 53	42 53	43 52	44 52	45 52	46 52	47 52	8 8'0		
10	41 17	42 17	43 17	44 17	45 17	46 17	47 17	48 17	9 9'0		
11	41 42	42 42	43 41	44 41	45 41	46 41	47 41	48 41			
12	42 4	43 4	44 4	45 4	46 4	47 4	48 3	49 3			
13	42 25	43 24	44 24	45 24	46 24	47 24	48 23	49 23	1 1'0		
14	42 45	43 44	44 44	45 44	46 44	47 44	48 44	49 44	2 2'0		
15	43 3	44 3	45 3	46 2	47 2	48 2	49 2	50 2	3 3'0		
16	43 21	44 21	45 21	46 21	47 21	48 20	49 20	50 20	4 4'0		
17	43 38	44 37	45 37	46 37	47 36	48 36	49 36	50 36	5 5'0		
18	43 53	44 53	45 53	46 53	47 53	48 53	49 52	50 52	6 6'0		
19	44 9	45 9	46 8	47 8	48 8	49 8	50 8	51 7	7 7'0		
20	44 23	45 23	46 23	47 22	48 22	49 21	50 21	51 21	8 8'0		
21	44 36	45 36	46 35	47 35	48 35	49 35	50 34	51 34	9 9'0		
22	44 49	45 49	46 49	47 48	48 48	49 48	50 48	51 47			
23	45 1	46 1	47 1	48 0	49 0	49 59	50 59	51 59			
24	45 12	46 12	47 11	48 11	49 11	50 11	51 10	52 10			
25	45 23	46 23	47 23	48 22	49 22	50 22	51 21	52 21	1 1'0		
26	45 33	46 33	47 33	48 32	49 32	50 31	51 31	52 31	2 2'0		
27	45 43	46 43	47 42	48 42	49 42	50 41	51 41	52 41	3 3'0		
28	45 53	46 53	47 52	48 52	49 52	50 51	51 50	52 50	4 4'0		
29	46 2	47 2	48 1	49 1	50 0	51 0	51 59	52 59	5 5'0		
30	46 11	47 10	48 10	49 10	50 9	51 9	52 8	53 8	6 6'0		
31	46 20	47 19	48 19	49 18	50 18	51 17	52 17	53 16	7 7'0		
32	46 28	47 27	48 26	49 26	50 26	51 25	52 25	53 24	8 8'0		
33	46 34	47 34	48 33	49 33	50 32	51 32	52 31	53 31	9 9'0		
34	46 41	47 41	48 40	49 39	50 39	51 38	52 38	53 37			
35	46 48	47 47	48 47	49 46	50 46	51 45	52 44	53 44			
36	46 54	47 54	48 53	49 53	50 52	51 52	52 51	53 51			
37	47 0	47 59	48 59	49 58	50 58	51 57	52 56	53 56	1 1'0		
38	47 6	48 5	49 5	50 4	51 3	52 3	53 2	54 2	2 2'0		
39	47 12	48 11	49 10	50 9	51 9	52 8	53 7	54 7	3 3'0		
40	47 17	48 16	49 16	50 15	51 14	52 14	53 13	54 12	4 4'0		
41	47 22	48 21	49 20	50 19	51 19	52 18	53 17	54 17	5 5'0		
42	47 26	48 25	49 25	50 24	51 23	52 22	53 22	54 21	6 6'0		
43	47 32	48 31	49 30	50 29	51 29	52 28	53 27	54 26	7 7'0		
44	47 35	48 34	49 34	50 33	51 32	52 31	53 31	54 30	8 8'0		
45	47 40	48 39	49 38	50 37	51 36	52 35	53 35	54 34	9 9'0		
46	47 44	48 43	49 42	50 41	51 41	52 40	53 39	54 38			
47	47 48	48 46	49 46	50 45	51 44	52 43	53 42	54 41			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.		Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.
			54'	55'	56'	57'	58'	59'	60'	61'			
		0	" "	" "	" "	" "	" "	" "	" "	" "			
"	10	0	47 51	48 50	49 49	50 48	51 47	52 46	53 45	54 44	"	"	
+		10	47 54	48 53	49 52	50 52	51 50	52 49	53 49	54 47	"	"	
1	0	20	47 57	48 57	49 55	50 55	51 54	52 52	53 52	54 51	1	1'0	
2	0	30	48 1	49 0	49 59	50 58	51 57	52 56	53 55	54 54	2	2'0	
3	1	40	48 4	49 3	50 2	51 1	52 0	52 59	53 58	54 57	3	2'9	
4	1	50	48 6	49 5	50 4	51 3	52 2	53 1	54 0	54 59	4	3'9	
5	1	11	0 48 9	49 7	50 6	51 5	52 4	53 3	54 2	55 1	5	4'9	
6	1	10	48 11	49 10	50 8	51 7	52 6	53 5	54 4	55 3	6	5'9	
7	1	20	48 13	49 12	50 11	51 9	52 8	53 7	54 6	55 5	7	6'9	
8	2	30	48 15	49 14	50 13	51 12	52 10	53 9	54 8	55 7	8	7'9	
9	2	40	48 17	49 16	50 14	51 13	52 12	53 11	54 10	55 8	9	8'8	
		50	48 19	49 18	50 17	51 15	52 14	53 13	54 11	55 10			
<hr/>													
"		12	0 48 21	49 20	50 19	51 17	52 16	53 15	54 13	55 12	"	"	
1	0	10	48 23	49 22	50 20	51 19	52 18	53 16	54 15	55 14	1	"	
2	0	20	48 24	49 23	50 22	51 20	52 19	53 17	54 16	55 15	1	1'0	
3	0	30	48 26	49 25	50 23	51 22	52 21	53 19	54 17	55 16	2	2'0	
4	0	40	48 27	49 26	50 24	51 23	52 21	53 20	54 18	55 17	3	2'9	
5	1	50	48 28	49 27	50 25	51 24	52 22	53 21	54 19	55 18	4	3'9	
6	1	13	0 48 29	49 27	50 26	51 24	52 23	53 21	54 20	55 19	5	4'9	
7	1	10	48 31	49 29	50 28	51 26	52 25	53 23	54 21	55 19	6	5'9	
8	1	20	48 31	49 30	50 28	51 27	52 25	53 24	54 22	55 20	7	6'9	
9	1	30	48 33	49 30	50 29	51 27	52 26	53 24	54 22	55 20	8	7'9	
		40	48 32	49 31	50 29	51 28	52 26	53 24	54 22	55 21	9	8'8	
		50	48 33	49 31	50 30	51 28	52 26	53 24	54 23	55 21			
<hr/>													
"		14	0 48 34	49 32	50 30	51 29	52 27	53 25	54 23	55 21	"	"	
1	0	10	48 34	49 33	50 31	51 29	52 27	53 26	54 24	55 22	1	"	
2	0	20	48 34	49 32	50 31	51 29	52 27	53 25	54 24	55 22	1	1'0	
3	0	30	48 35	49 33	50 31	51 29	52 27	53 25	54 24	55 22	2	1'9	
4	0	40	48 35	49 34	50 32	51 29	52 28	53 26	54 23	55 22	3	2'9	
5	0	50	48 35	49 33	50 31	51 29	52 27	53 25	54 23	55 21	4	3'9	
6	0	15	0 48 36	49 34	50 31	51 30	52 27	53 25	54 23	55 21	5	4'8	
7	0	10	48 35	49 33	50 31	51 29	52 27	53 25	54 23	55 21	6	5'8	
8	0	20	48 35	49 33	50 31	51 29	52 26	53 24	54 22	55 20	7	6'8	
9	0	30	48 35	49 33	50 31	51 28	52 26	53 24	54 22	55 20	8	7'7	
		40	48 34	49 33	50 30	51 28	52 26	53 24	54 21	55 19	9	8'7	
		50	48 34	49 32	50 30	51 27	52 25	53 23	54 20	55 18			
<hr/>													
"		16	0 48 34	49 31	50 29	51 26	52 24	53 22	54 20	55 17	"	"	
1	0	10	48 33	49 31	50 28	51 26	52 24	53 21	54 19	55 16	"	"	
2	0	20	48 32	49 30	50 27	51 25	52 23	53 20	54 18	55 15	1	1'0	
3	0	30	48 32	49 29	50 26	51 24	52 22	53 19	54 17	55 14	2	1'9	
4	0	40	48 31	49 28	50 26	51 24	52 21	53 18	54 16	55 13	3	2'9	
5	0	50	48 30	49 27	50 25	51 23	52 20	53 17	54 15	55 12	4	3'9	
6	1	17	0 48 29	49 27	50 24	51 22	52 19	53 16	54 14	55 11	5	4'8	
7	1	10	48 28	49 26	50 24	51 21	52 18	53 15	54 13	55 10	6	5'8	
8	1	20	48 28	49 25	50 23	51 20	52 17	53 14	54 12	55 9	7	6'8	
9	1	30	48 27	49 24	50 22	51 19	52 16	53 13	54 10	55 8	8	7'7	
		40	48 26	49 24	50 21	51 18	52 15	53 12	54 9	55 6	9	8'6	
		50	48 26	49 23	50 20	51 17	52 14	53 11	54 8	55 5			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.												
P. P. for Alt.	Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX:										P. P. for Par.
		54'	55'	56'	57'	58'	59'	60'	61'			
	0	48 24	49 21	50 18	51 15	52 12	53 9	54 6	55 3			
	10	48 23	49 20	50 17	51 14	52 11	53 8	54 5	55 2			
1	0	48 22	49 19	50 16	51 13	52 10	53 7	54 3	55 0	1 0'9		
2	0	48 20	49 17	50 14	51 10	52 7	53 4	54 1	54 58	2 1'9		
3	0	48 19	49 16	50 12	51 9	52 6	53 3	53 59	54 56	3 2'8		
4	1	48 18	49 15	50 11	51 8	52 4	53 1	53 58	54 55	4 3'8		
5	1	48 16	49 12	50 9	51 5	52 2	52 59	53 56	54 53	5 4'7		
6	1	48 15	49 11	50 8	51 4	52 1	52 58	53 54	54 51	6 5'7		
7	1	48 12	49 9	50 5	51 2	51 59	52 55	53 52	54 49	7 6'7		
8	1	48 11	49 8	50 4	51 1	51 57	52 54	53 51	54 47	8 7'6		
9	1	48 9	49 5	50 2	50 58	51 55	52 52	53 48	54 44	9 8'5		
	50	48 8	49 4	50 1	50 57	51 54	52 50	53 46	54 43			
	20	48 5	49 2	49 58	50 55	51 51	52 47	53 44	54 40			
	10	48 3	49 0	49 56	50 53	51 48	52 45	53 42	54 38			
1	0	48 2	48 58	49 55	50 51	51 47	52 43	53 40	54 36	1 0'9		
2	0	48 0	48 56	49 52	50 48	51 45	52 41	53 37	54 33	2 1'9		
3	1	47 58	48 54	49 50	50 46	51 42	52 38	53 34	54 30	3 2'8		
4	1	47 56	48 52	49 48	50 44	51 41	52 36	53 32	54 28	4 3'7		
5	1	47 54	48 50	49 46	50 42	51 38	52 34	53 30	54 26	5 4'6		
6	1	47 53	48 48	49 44	50 40	51 35	52 32	53 27	54 23	6 5'7		
7	2	47 50	48 46	49 42	50 37	51 34	52 30	53 25	54 21	7 6'6		
8	2	47 47	48 43	49 39	50 35	51 31	52 27	53 22	54 19	8 7'5		
9	2	47 45	48 41	49 36	50 32	51 28	52 24	53 20	54 15	9 8'4		
	50	47 44	48 39	49 35	50 31	51 26	52 22	53 18	54 13			
	22	47 41	48 37	49 32	50 28	51 24	52 19	53 15	54 11			
	10	47 39	48 34	49 30	50 25	51 21	52 16	53 12	54 7			
1	0	47 36	48 31	49 27	50 22	51 18	52 13	53 9	54 4	1 0'9		
2	1	47 33	48 29	49 24	50 20	51 15	52 11	53 6	54 2	2 1'8		
3	1	47 31	48 26	49 21	50 16	51 12	52 6	53 2	53 57	3 2'8		
4	1	47 28	48 23	49 19	50 14	51 9	52 5	53 0	53 55	4 3'8		
5	1	47 26	48 21	49 16	50 11	51 6	52 2	52 57	53 52	5 4'7		
6	2	47 24	48 19	49 14	50 9	51 4	51 59	52 54	53 50	6 5'6		
7	2	47 21	48 16	49 11	50 6	51 2	51 56	52 51	53 47	7 6'5		
8	2	47 18	48 13	49 9	50 3	50 58	51 54	52 48	53 43	8 7'4		
9	2	47 16	48 10	49 5	50 1	50 55	51 50	52 45	53 40	9 8'3		
	50	47 13	48 8	49 2	49 57	50 52	51 47	52 42	53 37			
	24	47 10	48 5	49 0	49 54	50 49	51 44	52 39	53 34			
	10	47 7	48 2	48 56	49 51	50 46	51 41	52 35	53 30			
1	0	47 4	47 59	48 54	49 48	50 43	51 38	52 32	53 27	1 0'9		
2	1	47 1	47 56	48 51	49 46	50 41	51 35	52 29	53 23	2 1'8		
3	1	46 58	47 53	48 47	49 42	50 37	51 31	52 25	53 20	3 2'7		
4	1	46 56	47 50	48 44	49 39	50 33	51 27	52 22	53 17	4 3'6		
5	2	46 52	47 47	48 41	49 36	50 30	51 24	52 19	53 13	5 4'5		
6	2	46 49	47 44	48 38	49 32	50 26	51 21	52 15	53 10	6 5'4		
7	2	46 46	47 40	48 34	49 28	50 22	51 17	52 11	53 5	7 6'4		
8	3	46 42	47 36	48 30	49 25	50 19	51 13	52 7	53 2	8 7'2		
9	3	46 39	47 33	48 27	49 22	50 16	51 10	52 4	53 0	9 8'1		
	50	46 36	47 30	48 24	49 18	50 12	51 6	52 0	53 0			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.		Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.
			54'	55'	56'	57'	58'	59'	60'	61'			
'	"	26 0	46 33	47 27	48 21	49 15	50 9	51 3	51 57	52 51			
	—	10	46 30	47 24	48 18	49 12	50 6	50 59	51 53	52 47	'	"	
1	0	20	46 27	47 20	48 14	49 8	50 2	50 56	51 49	52 43	1	0.9	
2	1	30	46 24	47 17	48 11	49 5	49 59	50 52	51 46	52 39	2	1.8	
3	1	40	46 20	47 13	48 6	49 1	49 54	50 47	51 41	52 35	3	2.7	
4	1	50	46 16	47 10	48 3	48 57	49 50	50 44	51 37	52 31	4	3.5	
5	2	27 0	46 13	47 7	48 0	48 53	49 47	50 40	51 34	52 27	5	4.4	
6	2	10	46 9	47 3	47 56	48 50	49 43	50 36	51 30	52 23	6	5.3	
7	2	20	46 6	47 0	47 53	48 46	49 39	50 33	51 26	52 19	7	6.3	
8	3	30	46 2	46 56	47 48	48 42	49 35	50 28	51 21	52 15	8	7.1	
9	3	40	45 59	46 52	47 45	48 38	49 31	50 24	51 17	52 11	9	8.0	
		50	45 55	46 48	47 41	48 34	49 27	50 20	51 14	52 6			
'	"	28 0	45 52	46 45	47 38	48 31	49 24	50 16	51 10	52 3			
	—	10	45 49	46 42	47 35	48 28	49 21	50 14	51 7	51 59	'	"	
1	0	20	45 45	46 38	47 30	48 23	49 16	50 9	51 2	51 54	1	0.9	
2	1	30	45 41	46 34	47 27	48 19	49 12	50 5	50 58	51 51	2	1.8	
3	1	40	45 37	46 31	47 23	48 16	49 8	50 1	50 54	51 46	3	2.6	
4	2	50	45 33	46 26	47 19	48 11	49 4	49 56	50 49	51 41	4	3.5	
5	2	29 0	45 29	46 21	47 14	48 6	48 59	49 51	50 44	51 36	5	4.4	
6	2	10	45 25	46 18	47 10	48 2	48 55	49 47	50 39	51 32	6	5.3	
7	3	20	45 22	46 14	47 6	47 58	48 51	49 43	50 36	51 28	7	6.2	
8	3	30	45 17	46 9	47 1	47 54	48 46	49 38	50 30	51 23	8	7.0	
9		40	45 13	46 5	46 58	47 50	48 42	49 34	50 26	51 18	9	7.9	
		50	45 9	46 2	46 54	47 46	48 38	49 31	50 22	51 14			
'	"	30 0	45 5	45 57	46 49	47 41	48 33	49 25	50 17	51 9			
	—	10	45 1	45 53	46 45	47 37	48 28	49 21	50 12	51 4	'	"	
1	0	20	44 58	45 49	46 41	47 33	48 25	49 16	50 8	51 0	1	0.9	
2	1	30	44 53	45 44	46 36	47 28	48 19	49 11	50 3	50 55	2	1.7	
3	1	40	44 49	45 41	46 32	47 24	48 15	49 7	49 59	50 50	3	2.6	
4	2	50	44 44	45 36	46 27	47 18	48 10	49 2	49 53	50 45	4	3.4	
5	2	31 0	44 40	45 31	46 23	47 15	48 6	48 57	49 49	50 40	5	4.3	
6	3	10	44 36	45 27	46 18	47 9	48 1	48 52	49 43	50 35	6	5.2	
7	3	20	44 31	45 23	46 14	47 5	47 56	48 48	49 39	50 30	7	6.1	
8	4	30	44 27	45 19	46 10	47 1	47 52	48 44	49 35	50 26	8	6.8	
9	4	40	44 24	45 15	46 6	46 57	47 48	48 39	49 30	50 21	9	7.7	
		50	44 19	45 10	46 1	46 52	47 43	48 34	49 25	50 16			
'	"	32 0	44 14	45 5	45 56	46 47	47 38	48 29	49 20	50 11			
	—	10	44 10	45 1	45 51	46 42	47 33	48 23	49 14	50 5	'	"	
1	0	20	44 6	44 56	45 47	46 38	47 29	48 19	49 10	50 0	1	0.8	
2	1	30	44 0	44 51	45 42	46 33	47 23	48 14	49 4	49 55	2	1.7	
3	1	40	43 57	44 47	45 37	46 28	47 19	48 9	49 0	49 50	3	2.5	
4	2	50	43 51	44 42	45 32	46 22	47 13	48 3	48 54	49 45	4	3.3	
5	2	33 0	43 47	44 38	45 28	46 18	47 8	47 59	48 49	49 40	5	4.2	
6	3	10	43 43	44 33	45 24	46 14	47 4	47 54	48 44	49 35	6	5.0	
7	3	20	43 39	44 29	45 19	46 9	47 0	47 49	48 40	49 30	7	5.9	
8	4	30	43 34	44 24	45 14	46 4	46 54	47 44	48 34	49 24	8	6.7	
9	4	40	43 29	44 20	45 10	45 59	46 49	47 39	48 29	49 19	9	7.5	
		50	43 25	44 14	45 4	45 54	46 44	47 34	48 23	49 13			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.																					
P. P. for Alt.	Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.									
		54'	55'	56'	57'	58'	59'	60'	61'												
		0	1	2	3	4	5	6	7	8	9	10									
1	1	34	0	43	20	44	10	45	0	45	50	46	39	47	29	48	18	49	8		
			10	43	15	44	5	44	54	45	44	46	33	47	23	48	12	49	2		
1	1		20	43	10	44	0	44	49	45	39	46	28	47	18	48	8	48	57	1	0.8
2	1		30	43	5	43	55	44	44	45	34	46	23	47	12	48	2	48	51	2	1.6
3	2		40	43	1	43	50	44	40	45	29	46	18	47	8	47	57	48	46	3	2.4
4	2		50	42	55	43	45	44	34	45	23	46	13	47	2	47	51	48	40	4	3.3
5	3	35	0	42	51	43	40	44	29	45	18	46	8	46	57	47	46	48	35	5	4.1
6	3		10	42	45	43	35	44	24	45	13	46	2	46	51	47	40	48	29	6	5.0
7	4		20	42	41	43	30	44	19	45	8	45	57	46	46	47	35	48	24	7	5.8
8	4		30	42	36	43	25	44	13	45	2	45	51	46	40	47	29	48	18	8	6.5
9	5		40	42	31	43	20	44	9	45	58	45	46	46	35	47	24	48	13	9	7.4
			50	42	26	43	14	44	3	45	52	45	40	46	29	47	17	48	6		
		36	0	42	21	43	9	43	58	44	47	45	35	46	24	47	12	48	1		
			10	42	15	43	4	43	53	44	41	45	29	46	18	47	6	47	55		
1	1		20	42	11	42	59	43	48	44	36	45	24	46	13	47	1	47	49	1	0.8
2	1		30	42	6	42	54	43	42	44	30	45	18	46	7	46	55	47	43	2	1.6
3	2		40	42	1	42	49	43	37	44	25	45	13	46	1	46	50	47	38	3	2.4
4	2		50	41	55	42	43	43	31	44	19	45	7	45	55	46	43	47	31	4	3.2
5	3	37	0	41	51	42	39	43	26	44	14	45	2	45	50	46	38	47	26	5	4.0
6	3		10	41	45	42	33	43	21	44	8	44	56	45	44	46	32	47	20	6	4.8
7	4		20	41	40	42	28	43	16	44	3	44	51	45	39	46	27	47	14	7	5.6
8	4		30	41	34	42	22	43	10	43	57	44	45	45	33	46	20	47	7	8	6.4
9	5		40	41	30	42	17	43	5	43	52	44	40	45	27	46	14	47	2	9	7.2
			50	41	24	42	11	42	59	43	46	44	34	45	21	46	8	46	56		
		38	0	41	19	42	6	42	54	43	41	44	28	45	15	46	3	46	51		
			10	41	14	42	0	42	48	43	35	44	22	45	9	45	56	46	44		
1	1		20	41	8	41	54	42	42	43	29	44	16	45	3	45	50	46	37	1	0.8
2	1		30	41	2	41	48	42	36	43	23	44	9	44	56	45	44	46	30	2	1.6
3	2		40	40	57	41	43	42	30	43	18	44	4	44	51	45	38	46	25	3	2.3
4	2		50	40	51	41	37	42	24	43	11	43	58	44	45	45	31	46	18	4	3.1
5	3	39	0	40	46	41	32	42	19	43	6	43	52	44	39	45	26	46	13	5	3.9
6	3		10	40	40	41	26	42	13	42	59	43	46	44	33	45	19	46	5	6	4.7
7	4		20	40	35	41	21	42	8	42	54	43	41	44	27	45	14	46	0	7	5.5
8	4		30	40	29	41	15	42	2	42	48	43	34	44	21	45	7	45	53	8	6.2
9	5		40	40	24	41	10	41	57	42	43	43	29	44	15	45	1	45	48	9	7.0
			50	40	18	41	4	41	50	42	36	43	22	44	9	44	54	45	30		
		40	0	40	13	40	59	41	45	42	31	43	17	44	3	44	49	45	35		
			10	40	7	40	53	41	38	42	25	43	10	43	56	44	42	45	28		
1	1		20	40	1	40	47	41	32	42	18	43	4	43	49	44	35	45	21	1	0.8
2	1		30	39	55	40	40	41	26	42	11	42	57	43	43	44	28	45	14	2	1.5
3	2		40	39	49	40	35	41	21	42	6	42	51	43	37	44	23	45	8	3	2.3
4	2		50	39	44	40	29	41	14	42	0	42	45	43	30	44	16	45	1	4	3.0
5	3	41	0	39	38	40	24	41	9	41	54	42	39	43	25	44	10	44	55	5	3.8
6	4		10	39	32	40	17	41	3	41	48	42	33	43	18	44	3	44	48	6	4.5
7	4		20	39	27	40	12	40	57	41	42	42	27	43	12	43	57	44	42	7	5.2
8	5		30	39	21	40	5	40	50	41	35	42	20	43	5	43	50	44	35	8	5.9
9	5		40	39	15	40	0	40	45	41	30	42	15	42	59	43	44	44	29	9	6.6
			50	39	9	39	54	40	39	41	23	42	8	42	53	43	38	44	22		

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.	Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.								P. P. for Par.
		54'	55'	56'	57'	58'	59'	60'	61'	
' "	42 0	39 3	39 47	40 32	41 17	42 1	42 46	43 30	44 15	' "
—	10	38 56	39 41	40 26	41 10	41 54	42 39	43 23	44 8	' "
1 1	20	38 51	39 36	40 20	41 4	41 49	42 33	43 17	44 1	1 0.7
2 1	30	38 45	39 29	40 13	40 57	41 42	42 26	43 10	43 54	2 1.5
3 2	40	38 40	39 25	40 8	40 52	41 36	42 20	43 4	43 48	3 2.2
4 3	50	38 33	39 17	40 1	40 45	41 29	42 13	42 57	43 41	4 2.9
5 3	43 0	38 27	39 11	39 56	40 39	41 23	42 7	42 51	43 35	5 3.6
6 4	20	38 21	39 5	39 48	40 32	41 16	42 0	42 44	43 27	6 4.4
7 5	20	38 15	38 59	39 42	40 26	41 9	41 53	42 36	43 20	7 5.1
8 5	30	38 8	38 52	39 35	40 19	41 2	41 46	42 29	43 13	8 5.8
9 6	40	38 3	38 46	39 30	40 13	40 57	41 40	42 23	43 7	9 6.6
	50	37 56	38 39	39 23	40 6	40 49	41 33	42 16	42 59	
' "	44 0	37 50	38 34	39 17	40 0	40 43	41 26	42 10	42 53	' "
1 1	10	37 44	38 27	39 10	39 53	40 36	41 19	42 2	42 46	1 0.7
2 1	20	37 38	38 20	39 4	39 46	40 29	41 12	41 55	42 38	2 1.4
3 2	30	37 31	38 14	38 56	39 40	40 22	41 5	41 48	42 31	3 2.1
4 3	40	37 26	38 8	38 51	39 33	40 16	40 59	41 41	42 24	4 2.8
5 3	45 0	37 13	37 55	38 38	39 21	40 3	40 45	41 28	42 10	5 3.5
6 4	10	37 7	37 49	38 31	39 14	39 56	40 39	41 21	42 3	6 4.2
7 5	20	37 0	37 42	38 24	39 6	39 48	40 31	41 13	41 55	7 4.9
8 5	30	36 53	37 35	38 17	38 59	39 41	40 23	41 5	41 48	8 5.6
9 6	40	36 47	37 29	38 11	38 53	39 35	40 17	40 59	41 41	9 6.3
	50	36 40	37 22	38 4	38 46	39 28	40 10	40 51	41 33	
' "	46 0	36 35	37 17	37 58	38 40	39 21	40 3	40 45	41 26	' "
1 1	10	36 28	37 9	37 51	38 33	39 14	39 56	40 37	41 19	1 0.7
2 1	20	36 21	37 3	37 44	38 26	39 7	39 48	40 30	41 11	2 1.4
3 2	30	36 14	36 56	37 37	38 18	38 59	39 41	40 22	41 3	3 2.0
4 3	40	36 9	36 49	37 31	38 12	38 53	39 34	40 15	40 57	4 2.7
5 4	47 0	35 56	36 37	37 17	37 58	38 40	39 20	40 1	40 42	5 3.4
6 4	10	35 49	36 29	37 10	37 51	38 32	39 13	39 53	40 34	6 4.1
7 5	20	35 42	36 23	37 3	37 44	38 25	39 5	39 46	40 26	7 4.8
8 6	30	35 35	36 16	36 56	37 37	38 17	38 58	39 38	40 19	8 5.5
9 6	40	35 29	36 9	36 50	37 30	38 11	38 51	39 32	40 12	9 6.2
	50	35 22	36 2	36 42	37 22	38 3	38 44	39 24	40 4	
' "	48 0	35 16	35 56	36 36	37 16	37 57	38 37	39 17	39 57	' "
1 1	10	35 9	35 49	36 29	37 9	37 49	38 29	39 9	39 49	1 0.6
2 1	20	35 2	35 42	36 22	37 1	37 42	38 21	39 1	39 41	2 1.3
3 2	30	34 55	35 34	36 15	36 54	37 34	38 13	38 54	39 33	3 1.9
4 3	40	34 49	35 28	36 8	36 47	37 28	38 7	38 47	39 24	4 2.6
5 4	49 0	34 42	35 21	36 1	36 40	37 20	37 59	38 39	39 18	5 3.2
6 4	10	34 35	35 14	35 53	36 33	37 12	37 52	38 31	39 10	6 3.9
7 5	20	34 28	35 7	35 46	36 25	37 4	37 44	38 23	39 2	7 4.6
8 6	30	34 21	35 0	35 39	36 18	36 58	37 37	38 16	38 55	8 5.2
9 6	40	34 14	34 53	35 32	36 11	36 50	37 29	38 8	38 47	9 5.9
	50	34 7	34 46	35 26	36 4	36 43	37 22	38 1	38 40	38 32

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.		Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.
			54'	55'	56'	57'	58'	59'	60'	61'			
"	"	50	0	33 54	34 32	35 11	35 49	36 28	37 6	37 45	38 24		
		10	33 46	34 25	35 3	35 42	36 20	36 58	37 37	38 15	"		
1	1	20	33 40	34 19	34 57	35 35	36 13	36 52	37 30	38 8	1	0.6	
2	2	30	33 33	34 11	34 49	35 28	36 5	36 44	37 22	38 0	2	1.2	
3	3	40	33 26	34 4	34 41	35 20	35 58	36 36	37 14	37 52	3	1.9	
4	4	50	33 19	33 57	34 35	35 13	35 51	36 29	37 6	37 45	4	2.5	
5	5	51	0	33 12	33 50	34 27	35 5	35 43	36 21	36 59	5	3.1	
6	6	10	33 5	33 42	34 20	34 57	35 35	36 13	36 51	37 28	6	3.8	
7	7	20	32 58	33 36	34 13	34 51	35 28	36 6	36 43	37 21	7	4.5	
8	8	30	32 51	33 28	34 6	34 43	35 21	35 58	36 35	37 12	8	5.1	
9	9	40	32 43	33 21	33 57	34 35	35 12	35 49	36 27	37 4	9	5.7	
10	10	50	32 36	33 13	33 51	34 27	35 4	35 42	36 19	36 56			
"	"	52	0	32 29	33 6	33 43	34 19	34 57	35 33	36 10	36 48		
		10	32 21	32 58	33 35	34 12	34 49	35 25	36 2	36 40	"		
1	1	20	32 15	32 52	33 28	34 5	34 41	35 18	35 55	36 32	1	0.6	
2	2	30	32 7	32 44	33 20	33 57	34 34	35 10	35 47	36 23	2	1.2	
3	3	40	32 0	32 36	33 13	33 49	34 25	35 2	35 39	36 14	3	1.8	
4	4	50	31 53	32 30	33 6	33 42	34 18	34 54	35 31	36 7	4	2.4	
5	5	53	0	31 46	32 22	32 58	33 34	34 11	34 47	35 23	5	3.0	
6	6	10	31 38	32 14	32 50	33 26	34 2	34 38	35 14	35 50	6	3.6	
7	7	20	31 32	32 7	32 43	33 19	33 55	34 31	35 7	35 43	7	4.2	
8	8	30	31 24	32 0	32 36	33 11	33 47	34 22	34 58	35 34	8	4.8	
9	9	40	31 16	31 52	32 28	33 3	33 39	34 15	34 50	35 25	9	5.4	
10	10	50	31 10	31 46	32 21	32 56	33 32	34 7	34 43	35 18			
"	"	54	0	31 2	31 38	32 13	32 48	33 23	33 59	34 34	35 9		
		10	30 55	31 30	32 5	32 40	33 15	33 50	34 26	35 1	"		
1	1	20	30 47	31 22	31 57	32 32	33 7	33 43	34 17	34 52	1	0.6	
2	2	30	30 40	31 14	31 49	32 24	32 59	33 34	34 8	34 43	2	1.2	
3	3	40	30 32	31 7	31 41	32 16	32 50	33 25	34 0	34 35	3	1.7	
4	4	50	30 25	31 0	31 34	32 9	32 44	33 18	33 53	34 27	4	2.3	
5	5	55	0	30 17	30 52	31 26	32 0	32 35	33 9	33 44	5	2.9	
6	6	10	30 9	30 44	31 18	31 53	32 27	33 1	33 35	34 9	6	3.4	
7	7	20	30 3	30 37	31 11	31 45	32 19	32 54	33 28	34 2	7	4.0	
8	8	30	29 55	30 29	31 3	31 37	32 11	32 45	33 19	33 53	8	4.6	
9	9	40	29 48	30 21	30 55	31 29	32 3	32 37	33 10	33 44	9	5.1	
10	10	50	29 41	30 14	30 48	31 22	31 55	32 29	33 3	33 37			
"	"	56	0	29 33	30 7	30 40	31 13	31 47	32 20	32 54	33 28		
		10	29 25	29 58	30 32	31 5	31 38	32 12	32 46	33 19	"		
1	1	20	29 17	29 50	30 23	30 57	31 30	32 4	32 37	33 10	1	0.5	
2	2	30	29 9	29 43	30 16	30 49	31 22	31 55	32 28	33 1	2	1.1	
3	3	40	29 1	29 34	30 7	30 41	31 13	31 46	32 19	32 52	3	1.6	
4	4	50	28 54	29 27	30 0	30 33	31 6	31 39	32 11	32 44	4	2.1	
5	5	57	0	28 47	29 20	29 52	30 24	30 57	31 30	32 3	5	2.7	
6	6	10	28 39	29 11	29 44	30 17	30 49	31 21	31 54	32 26	6	3.2	
7	7	20	28 32	29 4	29 37	30 9	30 41	31 14	31 46	32 18	7	3.7	
8	8	30	28 24	28 56	29 28	30 1	30 33	31 5	31 37	32 10	8	4.2	
9	9	40	28 16	28 48	29 20	29 52	30 24	30 57	31 28	32 1	9	4.7	
10	10	50	28 9	28 41	29 13	29 45	30 17	30 49	31 20	31 53			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.	Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.									
		54'	55'	56'	57'	58'	59'	60'	61'		
	0	28 1	28 33	29 5	29 37	30 8	30 40	31 12	31 44		
	10	27 53	28 25	28 56	29 28	29 59	30 31	31 3	31 34		
1	20	27 45	28 16	28 48	29 19	29 51	30 22	30 54	31 25		
2	30	27 37	28 8	28 40	29 11	29 42	30 14	30 45	31 16		
3	40	27 29	28 0	28 31	29 2	29 34	30 5	30 36	31 7		
4	50	27 22	27 53	28 24	28 55	29 26	29 57	30 28	30 59		
5	59	27 14	27 45	28 15	28 47	29 17	29 48	30 19	30 50		
6	10	27 6	27 36	28 7	28 38	29 9	29 39	30 10	30 41		
7	20	26 58	27 29	28 0	28 30	29 1	29 31	30 2	30 33		
8	30	26 51	27 21	27 51	28 22	28 52	29 22	29 53	30 24		
9	40	26 42	27 13	27 43	28 13	28 43	29 14	29 44	30 15		
	50	26 34	27 4	27 34	28 4	28 35	29 5	29 35	30 5		
	60	26 26	26 56	27 26	27 56	28 26	28 56	29 26	29 56		
	10	26 18	26 48	27 18	27 48	28 17	28 47	29 17	29 47		
1	20	26 11	26 40	27 10	27 40	28 10	28 39	29 9	29 38		
2	30	26 2	26 32	27 2	27 31	28 1	28 30	29 0	29 29		
3	40	25 54	26 23	26 53	27 22	27 52	28 21	28 50	29 20		
4	50	25 47	26 16	26 45	27 15	27 44	28 13	28 42	29 12		
5	59	25 39	26 8	26 37	27 6	27 35	28 4	28 33	29 2		
6	10	25 30	25 59	26 29	26 57	27 26	27 55	28 24	28 53		
7	20	25 22	25 51	26 20	26 48	27 17	27 46	28 15	28 44		
8	30	25 14	25 42	26 11	26 40	27 9	27 37	28 6	28 35		
9	40	25 6	25 34	26 2	26 31	27 0	27 28	27 57	28 25		
	50	24 58	25 27	25 55	26 24	26 52	27 20	27 48	28 16		
	62	24 50	25 18	25 46	26 15	26 43	27 11	27 39	28 7		
	10	24 42	25 10	25 38	26 6	26 34	27 2	27 30	27 58		
1	20	24 34	25 2	25 30	25 58	26 26	26 54	27 22	27 49		
2	30	24 26	24 54	25 22	25 49	26 17	26 44	27 12	27 40		
3	40	24 17	24 45	25 13	25 40	26 8	26 35	27 3	27 31		
4	50	24 10	24 37	25 4	25 32	25 59	26 26	26 53	27 21		
5	59	24 1	24 28	24 55	25 23	25 50	26 17	26 44	27 11		
6	10	23 53	24 20	24 47	25 14	25 41	26 8	26 35	27 2		
7	20	23 45	24 12	24 39	25 6	25 33	26 0	26 27	26 54		
8	30	23 36	24 3	24 30	24 57	25 24	25 51	26 17	26 44		
9	40	23 28	23 55	24 21	24 48	25 15	25 41	26 8	26 35		
	50	23 21	23 47	24 14	24 40	25 7	25 33	26 0	26 26		
	64	23 12	23 39	24 5	24 31	24 58	25 24	25 50	26 16		
	10	23 4	23 30	23 56	24 22	24 48	25 16	25 41	26 7		
1	20	22 55	23 21	23 48	24 13	24 39	25 5	25 31	25 57		
2	30	22 47	23 13	23 39	24 4	24 30	24 56	25 22	25 48		
3	40	22 39	23 4	23 30	23 55	24 21	24 47	25 12	25 38		
4	50	22 31	22 56	23 22	23 47	24 13	24 38	25 4	25 29		
5	59	22 22	22 47	23 13	23 38	24 4	24 29	24 55	25 20		
6	10	22 14	22 39	23 4	23 29	23 55	24 20	24 45	25 10		
7	20	22 5	22 30	22 55	23 20	23 46	24 10	24 35	25 1		
8	30	21 56	22 22	22 46	23 11	23 36	24 1	24 26	24 51		
9	40	21 48	22 13	22 37	23 2	23 27	23 52	24 16	24 41		
	50	21 41	22 5	22 30	22 54	23 18	23 43	24 8	24 24		

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.		Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.										P. P. for Par.
			54'	55'	56'	57'	58'	59'	60'	61'			
		66	0 21 32	21 56	22 21	22 45	23 9	23 34	23 58	24 23			
		10	21 23	21 48	22 12	22 36	23 0	23 24	23 48	24 13			
1	1	20	21 16	21 40	22 4	22 28	22 52	23 16	23 40	24 4	1 0'4		
2	2	30	21 7	21 31	21 55	22 19	22 43	23 7	23 31	23 54	2 0'8		
3	3	40	20 58	21 22	21 46	22 10	22 33	22 57	23 21	23 45	3 1'1		
4	4	50	20 49	21 13	21 37	22 0	22 24	22 48	23 11	23 35	4 1'5		
5	5	67	0 20 41	21 4	21 28	21 51	22 15	22 38	23 1	23 25	5 1'9		
6	6	10	20 32	20 55	21 19	21 42	22 6	22 29	22 52	23 15	6 2'3		
7	7	20	20 25	20 48	21 11	21 34	21 57	22 20	22 43	23 7	7 2'7		
8	8	30	20 16	20 39	21 2	21 25	21 48	22 11	22 34	22 56	8 3'0		
9	9	40	20 7	20 30	20 53	21 16	21 38	22 1	22 24	22 47	9 3'4		
		50	19 58	20 21	20 44	21 7	21 29	21 52	22 14	22 37			
		68	0 19 50	20 12	20 35	20 57	21 20	21 42	22 5	22 27			
		10	19 41	20 3	20 26	20 48	21 11	21 32	21 55	22 17			
1	1	20	19 33	19 56	20 18	20 39	21 2	21 24	21 46	22 8	1 0'4		
2	2	30	19 24	19 47	20 8	20 30	20 53	21 14	21 36	21 59	2 0'7		
3	3	40	19 15	19 38	19 59	20 21	20 43	21 3	21 25	21 49	3 1'1		
4	4	50	19 8	19 30	19 51	20 13	20 34	20 56	21 18	21 40	4 1'5		
5	5	69	0 18 59	19 21	19 42	20 4	20 25	20 46	21 8	21 30	5 1'8		
6	6	10	18 51	19 12	19 33	19 54	20 16	20 36	20 58	21 19	6 2'2		
7	7	20	18 42	19 3	19 24	19 45	20 6	20 27	20 49	21 10	7 2'5		
8	8	30	18 33	18 54	19 15	19 36	19 57	20 18	20 39	21 0	8 2'9		
9	9	40	18 24	18 45	19 6	19 27	19 46	20 8	20 29	20 50	9 3'3		
		50	18 16	18 37	18 58	19 18	19 39	19 59	20 20	20 41			
		70	0 18 7	18 28	18 48	19 9	19 29	19 50	20 10	20 31			
		10	17 58	18 19	18 39	18 59	19 20	19 40	20 1	20 21			
1	1	20	17 49	18 10	18 30	18 50	19 10	19 31	19 50	20 11	1 0'3		
2	2	30	17 41	18 1	18 20	18 41	19 1	19 20	19 41	20 1	2 0'7		
3	3	40	17 33	17 53	18 12	18 32	18 52	19 12	19 32	19 51	3 1'0		
4	4	50	17 24	17 44	18 3	18 23	18 42	19 2	19 22	19 42	4 1'3		
5	5	71	0 17 15	17 35	17 54	18 14	18 33	18 53	19 12	19 32	5 1'7		
6	6	10	17 6	17 25	17 45	18 4	18 23	18 43	19 2	19 21	6 2'0		
7	7	20	16 57	17 16	17 35	17 54	18 14	18 33	18 52	19 11	7 2'3		
8	8	30	16 48	17 7	17 26	17 45	18 4	18 23	18 42	19 2	8 2'6		
9	9	40	16 40	16 59	17 18	17 37	17 55	18 15	18 33	18 52	9 3'0		
		50	16 31	16 50	17 9	17 27	17 46	18 5	18 24	18 42			
		72	0 16 22	16 41	16 59	17 18	17 36	17 55	18 13	18 32			
		10	16 13	16 31	16 50	17 9	17 27	17 45	18 3	18 22			
1	1	20	16 4	16 22	16 41	16 59	17 17	17 36	17 54	18 12	1 0'3		
2	2	30	15 55	16 13	16 31	16 49	17 7	17 25	17 43	18 1	2 0'6		
3	3	40	15 47	16 5	16 23	16 41	16 59	17 17	17 35	17 52	3 0'9		
4	4	50	15 38	15 56	16 14	16 31	16 49	17 7	17 25	17 42	4 1'2		
5	5	73	0 15 29	15 47	16 4	16 22	16 40	16 57	17 14	17 32	5 1'5		
6	6	10	15 20	15 38	15 55	16 13	16 30	16 47	17 5	17 22	6 1'8		
7	7	20	15 11	15 28	15 46	16 3	16 20	16 37	16 55	17 12	7 2'1		
8	8	30	15 2	15 19	15 36	15 53	16 10	16 28	16 44	17 28			
9	9	40	14 54	15 11	15 28	15 45	16 2	16 18	16 35	16 52			
		50	14 45	15 2	15 18	15 35	15 52	16 9	16 26	16 43			

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.	Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.									P. P. for Par.
		54	55'	56'	57'	58'	59'	60'	61'		
	0	"	"	"	"	"	"	"	"	"	
1	74	0	14 36	14 53	15 9	15 26	15 42	15 59	16 15	16 32	
1	1	10	14 27	14 44	15 0	15 16	15 32	15 49	16 5	16 21	"
2	2	20	14 18	14 34	14 50	15 6	15 23	15 39	15 55	16 11	0°3
3	3	30	14 9	14 25	14 41	14 57	15 13	15 29	15 45	16 1	0°5
4	4	40	14 1	14 16	14 33	14 48	15 4	15 20	15 36	15 52	0°8
5	5	50	13 52	14 7	14 23	14 39	14 54	15 10	15 26	15 42	1°1
6	6	75	0	13 43	13 58	14 13	14 29	14 45	15 0	15 16	1°3
7	7	10	13 33	13 49	14 4	14 19	14 35	14 50	15 6	15 21	1°6
8	8	20	13 24	13 40	13 55	14 10	14 25	14 40	14 55	15 10	1°8
9	9	30	13 15	13 30	13 45	14 0	14 15	14 30	14 45	15 0	2°1
		40	13 7	13 22	13 37	13 52	14 7	14 22	14 36	14 51	2°4
		50	12 58	13 13	13 28	13 42	13 57	14 11	14 26	14 41	
	76	0	12 49	13 4	13 18	13 32	13 47	14 1	14 16	14 31	
1	1	10	12 40	12 54	13 8	13 23	13 37	13 52	14 6	14 20	"
2	2	20	12 31	12 44	12 59	13 13	13 27	13 41	13 56	14 10	0°2
3	3	30	12 22	12 35	12 49	13 4	13 17	13 31	13 46	13 59	0°5
4	4	40	12 13	12 27	12 41	12 55	13 9	13 23	13 36	13 50	0°7
5	5	50	12 4	12 18	12 32	12 45	12 59	13 12	13 26	13 39	0°9
6	6	77	0	11 55	12 8	12 22	12 35	12 49	13 2	13 16	1°1
7	7	10	11 45	11 59	12 12	12 26	12 40	12 53	13 7	13 20	1°4
8	8	20	11 37	11 51	12 3	12 16	12 30	12 43	12 57	13 10	1°6
9	9	30	11 28	11 41	11 54	12 7	12 21	12 34	12 47	13 0	1°8
		40	11 19	11 32	11 45	11 58	12 11	12 24	12 37	12 49	2°1
		50	11 11	11 23	11 36	11 49	12 1	12 14	12 26	12 39	
	78	0	11 2	11 14	11 26	11 39	11 51	12 4	12 16	12 29	
1	1	10	10 52	11 5	11 17	11 29	11 42	11 54	12 6	12 19	"
2	2	20	10 43	10 55	11 8	11 20	11 32	11 44	11 56	12 8	0°2
3	3	30	10 34	10 46	10 58	11 10	11 22	11 34	11 46	11 58	0°4
4	4	40	10 26	10 38	10 49	11 1	11 12	11 24	11 36	11 48	0°6
5	5	50	10 17	10 28	10 39	10 51	11 3	11 14	11 26	11 38	0°8
6	6	79	0	10 7	10 18	10 30	10 41	10 53	11 4	11 16	1°0
7	7	10	9 58	10 9	10 21	10 32	10 43	10 54	11 6	11 17	1°2
8	8	20	9 48	10 0	10 11	10 22	10 33	10 44	10 56	11 7	1°4
9	9	30	9 39	9 50	10 2	10 13	10 24	10 35	10 46	10 57	1°6
		40	9 31	9 42	9 52	10 3	10 14	10 25	10 35	10 46	1°8
		50	9 22	9 33	9 43	9 53	10 4	10 15	10 25	10 36	
	80	0	9 13	9 23	9 33	9 44	9 54	10 5	10 15	10 25	
1	1	10	9 3	9 14	9 24	9 34	9 44	9 55	10 5	10 15	"
2	2	20	8 54	9 4	9 15	9 25	9 35	9 45	9 55	10 5	0°2
3	3	30	8 45	8 55	9 5	9 15	9 25	9 35	9 45	9 55	0°3
4	4	40	8 36	8 46	8 56	9 5	9 15	9 25	9 34	9 44	0°5
5	5	50	8 27	8 37	8 46	8 56	9 5	9 15	9 24	9 34	0°6
6	6	81	0	8 18	8 27	8 37	8 46	8 55	9 5	9 14	0°8
7	7	10	8 9	8 18	8 27	8 36	8 45	8 55	9 4	9 13	1°0
8	8	20	8 0	8 9	8 18	8 27	8 36	8 45	8 54	9 3	1°1
9	9	30	7 50	7 59	8 8	8 17	8 26	8 35	8 44	8 52	1°3
		40	7 41	7 50	7 59	8 7	8 16	8 25	8 33	8 42	1°5
		50	7 32	7 41	7 49	7 58	8 6	8 15	8 23	8 32	

TABLE XVII.—CORRECTION OF THE MOON'S ALTITUDE.

P. P. for Alt.		Moon's App. Alt.	MOON'S HORIZONTAL PARALLAX.								P. P. for Par.
			54'	55'	56'	57'	58'	59'	60'	61'	
'	"	82 0	7 23	7 31	7 40	7 48	7 56	8 5	8 13	8 21	' "
		10	7 14	7 22	7 30	7 38	7 46	7 55	8 3	8 11	' "
1	1	20	7 5	7 13	7 21	7 29	7 37	7 45	7 53	8 1	1 0.1
2	2	30	6 55	7 3	7 11	7 19	7 27	7 35	7 42	7 50	2 0.3
3	3	40	6 46	6 54	7 2	7 9	7 17	7 25	7 32	7 40	3 0.4
4	4	50	6 37	6 45	6 52	7 0	7 7	7 14	7 22	7 29	4 0.5
5	5	83 0	6 28	6 35	6 42	6 50	6 57	7 4	7 12	7 19	5 0.6
6	6	10	6 19	6 26	6 33	6 40	6 47	6 54	7 2	7 9	6 0.8
7	7	20	6 9	6 16	6 23	6 30	6 37	6 44	6 51	6 58	7 0.9
8	8	30	6 0	6 7	6 14	6 21	6 27	6 34	6 41	6 48	8 1.0
9	9	40	5 51	5 58	6 4	6 11	6 18	6 24	6 31	6 37	9 1.2
		50	5 42	5 48	5 55	6 1	6 8	6 14	6 21	6 27	
'	"	84 0	5 33	5 39	5 45	5 52	5 58	6 4	6 10	6 17	' "
		10	5 23	5 30	5 36	5 42	5 48	5 54	6 0	6 6	' "
1	1	20	5 14	5 20	5 26	5 32	5 38	5 44	5 50	5 56	1 0.1
2	2	30	5 5	5 11	5 17	5 22	5 28	5 34	5 40	5 45	2 0.2
3	3	40	4 56	5 1	5 7	5 13	5 18	5 24	5 29	5 35	3 0.3
4	4	50	4 47	4 52	4 57	5 3	5 8	5 14	5 19	5 24	4 0.4
5	5	85 0	4 37	4 43	4 48	4 53	4 58	5 4	5 9	5 14	5 0.5
6	6	10	4 28	4 33	4 38	4 43	4 48	4 53	4 59	5 4	6 0.6
7	7	20	4 19	4 24	4 29	4 34	4 38	4 43	4 48	4 53	7 0.6
8	8	30	4 10	4 14	4 19	4 24	4 29	4 33	4 38	4 43	8 0.7
9	9	40	4 0	4 5	4 10	4 14	4 19	4 23	4 28	4 32	9 0.8
		50	3 51	3 56	4 0	4 4	4 9	4 13	4 17	4 22	
'	"	86 0	3 42	3 46	3 50	3 55	3 59	4 3	4 7	4 11	' "
		10	3 33	3 37	3 41	3 45	3 49	3 53	3 57	4 1	' "
1	1	20	3 24	3 27	3 31	3 35	3 39	3 43	3 47	3 50	1 0.1
2	2	30	3 14	3 18	3 22	3 25	3 29	3 33	3 36	3 40	2 0.1
3	3	40	3 5	3 9	3 12	3 16	3 19	3 23	3 26	3 30	3 0.2
4	4	50	2 56	2 59	3 2	3 6	3 9	3 12	3 16	3 19	4 0.2
5	5	87 0	2 46	2 50	2 53	2 56	2 59	3 2	3 5	3 9	5 0.3
6	6	10	2 37	2 40	2 43	2 46	2 49	2 52	2 55	2 58	6 0.4
7	7	20	2 28	2 31	2 34	2 36	2 39	2 42	2 45	2 48	7 0.4
8	8	30	2 19	2 21	2 24	2 27	2 29	2 32	2 35	2 37	8 0.5
9	9	40	2 10	2 12	2 14	2 17	2 19	2 22	2 24	2 27	9 0.5
		50	2 0	2 3	2 5	2 7	2 9	2 12	2 14	2 16	
'	"	88 0	1 51	1 53	1 55	1 57	1 59	2 2	2 4	2 6	' "
		10	1 42	1 44	1 46	1 48	1 50	1 51	1 53	1 55	' "
1	1	20	1 33	1 34	1 36	1 38	1 40	1 41	1 43	1 45	1 0.0
2	2	30	1 23	1 25	1 26	1 28	1 30	1 31	1 33	1 34	2 0.1
3	3	40	1 14	1 15	1 17	1 18	1 20	1 21	1 22	1 24	3 0.1
4	4	50	1 5	1 7	1 8	1 10	1 11	1 12	1 13	1 14	4 0.1
5	5	89 0	0 56	0 57	0 58	0 59	1 0	1 1	1 2	1 3	5 0.1
6	6	10	0 46	0 47	0 48	0 49	0 50	0 51	0 52	0 52	6 0.2
7	7	20	0 37	0 38	0 38	0 39	0 40	0 41	0 41	0 42	7 0.2
8	8	30	0 28	0 28	0 29	0 29	0 30	0 30	0 31	0 31	8 0.3
9	9	40	0 18	0 19	0 19	0 20	0 20	0 20	0 21	0 21	9 0.3
		50	0 9	0 9	0 10	0 10	0 10	0 10	0 10	0 10	

TABLE XVIII.

LOGARITHMS FOR FINDING THE HORARY ANGLE OR APPARENT TIME.

Min.	2 Hours.	Diff.	3 Hours.	Diff.	4 Hours.	Diff.	5 Hours.	Diff.	6 Hours.	Diff.	7 Hours.	Diff.	Min.
0	8-825992	11737	9°16'5679	7602	9°37'9940	5457	9°568894	4107	9°698970	3152	9°798933	2418	60
1	833034	11635	170240	7555	401214	5428	571358	4088	700861	3138	800384	2407	59
2	840015	11535	174773	7509	404471	5401	573811	4070	702743	3124	801828	2396	58
3	846036	11437	179278	7463	407713	5375	576253	4052	704618	3110	803266	2385	57
4	853798	11340	183756	7418	410938	5348	578684	4033	706484	3097	804697	2375	56
5	860602	11245	9°18'8207	7373	9°41'4147	5322	9°581104	4015	9°708342	3083	9°806122	2364	55
6	867349	11152	192631	7329	417340	5296	583513	3997	710192	3070	807540	2353	54
7	874040	11061	197028	7285	420517	5270	585911	3980	712034	3057	808952	2342	53
8	880676	10970	201399	7241	423679	5243	588299	3962	713868	3043	810357	2332	52
9	887258	10880	205745	7198	426825	5217	590676	3944	715694	3030	811756	2321	51
10	8-893785	10792	9°21'0064	7156	9°42'9955	5192	9°593042	3927	9°717512	3017	9°813149	2311	50
11	900261	10706	214338	7114	433070	5167	595398	3910	719322	3005	814535	2300	49
12	906684	10620	218627	7073	436170	5142	597744	3892	721124	2992	815915	2289	48
13	913055	10536	222870	7032	439255	5117	600078	3875	722919	2978	817289	2279	47
14	919377	10453	227089	6991	442325	5092	602403	3857	724705	2965	818656	2268	46
15	8°92'5648	10371	9°23'1284	6950	9°44'5379	5067	9°604717	3840	9°726484	2952	9°820017	2258	45
16	931871	10290	235454	6910	448419	5043	607021	3823	728255	2939	821372	2248	44
17	938045	10210	239600	6870	451445	5018	609315	3806	730018	2926	822721	2237	43
18	944171	10132	243722	6831	454455	4993	611598	3790	731774	2913	824063	2227	42
19	950251	10055	247821	6792	457451	4969	613872	3772	733522	2900	825399	2217	41
20	956284		251897		460433	4946	616135		735262		826729	2207	40
21 Hours.		Diff.	20 Hours.	Diff.	19 Hours.	Diff.	18 Hours.	Diff.	17 Hours.	Diff.	16 Hours.	Diff.	Min.

TABLE XVIII.

LOGARITHMS FOR FINDING THE HORARY ANGLE OR APPARENT TIME

Min.	2 Hours.	Diff.	3 Hours.	Diff.	4 Hours.	Diff.	5 Hours.	Diff.	6 Hours.	Diff.	7 Hours.	Diff.	Min.
20	8956284	9979	9251897	6753	9460433	4945	9616135	3756	9735262	2887	9826729	2306	40
21	962271	9904	255949	6715	463400	4921	618388	3740	736994	2875	828053	2196	39
22	968213	9830	259978	6678	466354	4898	620632	3721	738719	2863	829370	2186	38
23	974111	9757	263985	6640	469293	4875	622865	3707	740437	2850	830682	2176	37
24	979965	9684	267969	6602	472218	4852	625089	3690	742147	2837	831987	2166	36
25	8985775	9612	9271930	6566	9475129	4828	9627303	3674	9743849	2825	9833287	2155	35
26	991543	9543	278780	6530	478026	4805	629507	3658	745544	2813	834580	2145	34
27	997269	9474	283684	6493	480909	4782	631701	3642	747232	2800	835867	2135	33
28	9002953	9405	287558	6457	483779	4760	633886	3626	748912	2788	837148	2125	32
29	008596	9338	291412	6422	486635	4738	636061	3610	750585	2776	838424	2115	31
30	9014198	9272	295244	6387	9489478	4715	9632227	3593	9752251	2763	9839693	2105	30
31	019761	9206	299055	6352	492307	4693	640383	3577	753009	2750	840956	2095	29
32	025284	9141	302845	6317	495123	4672	642529	3562	755560	2738	842213	2085	28
33	030768	9077	306615	6283	497926	4650	644666	3547	757203	2727	843464	2076	27
34	036213	9013	306615	6249	500716	4628	646794	3532	758840	2715	844710	2066	26
35	041621	8950	310364	6216	9503492	4607	9648913	3516	9760469	2703	9845949	2056	25
36	046991	8888	314094	6182	506256	4585	651022	3500	762091	2692	847183	2046	24
37	052323	8827	317803	6148	509007	4563	653122	3485	763706	2680	848410	2036	23
38	057619	8767	321492	6115	511745	4542	655213	3469	765314	2668	849632	2027	22
39	062879	8707	325161	6083	514470	4521	657294	3455	766914	2657	850848	2017	21
40	068103		328811		517183		659367	3455	768508		852058	2007	20
1 Hours.	Diff.	20 Hours.	Diff.	19 Hours.	Diff.	18 Hours.	Diff.	17 Hours.	Diff.	16 Hours.	Diff.	Min.	

TABLE XXI.—TRIGONOMETRICAL EQUIVALENTS.
(Arc c = half the arc a .)

$$\begin{aligned}
 (1.) \quad \sin a &= \cos a \cdot \tan a = \frac{\cos a}{\cot a} = \sqrt{1 - (\cos a)^2} = \frac{1}{\operatorname{cosec} a} \\
 &= \frac{1}{\sqrt{1 + (\cot a)^2}} = \frac{\tan a}{\sqrt{1 + (\tan a)^2}} = 2 \sin c \cdot \cos c \\
 &= \sqrt{\frac{1 - \cos 2a}{2}} = \frac{2 \tan c}{1 + (\tan c)^2} = \frac{2}{\cot c + \tan c} \\
 &= \frac{1}{\cot a + \tan c} = 2 \{ \sin (45^\circ + c) \}^2 - 1 = 1 - 2 \{ \sin (45^\circ - c) \}^2 \\
 &= \frac{1 - \{ \tan (45^\circ - c) \}^2}{1 + \{ \tan (45^\circ - c) \}^2} = \sin (60^\circ + a) - \sin (60^\circ - a).
 \end{aligned}$$

$$\begin{aligned}
 (2.) \quad \cos a &= \sin a \cdot \cot a = \frac{\sin a}{\tan a} = \sqrt{1 - (\sin a)^2} = \frac{1}{\sec a} \\
 &= \frac{1}{\sqrt{1 + (\tan a)^2}} = \frac{\cot a}{\sqrt{1 + (\cot a)^2}} = (\cos c)^2 - (\sin c)^2 \\
 &= 1 - 2 (\sin c)^2 = 2 (\cos c)^2 - 1 = \sqrt{\frac{1 + \cos 2a}{2}} \\
 &= \frac{1 - (\tan c)^2}{1 + (\tan c)^2} = \frac{\cot c - \tan c}{\cot c + \tan c} = \frac{1}{1 + \tan a \cdot \tan c}
 \end{aligned}$$

$$\begin{aligned}
 (3.) \quad \tan a &= \frac{\sin a}{\cos a} = \frac{1}{\cot a} = \sqrt{\frac{1}{(\cos a)^2} - 1} = \sqrt{(\sec a)^2 - 1} \\
 &= \frac{\sec a}{\operatorname{cosec} a} = \frac{\sin a}{\sqrt{1 - (\sin a)^2}} = \frac{\sin a \cdot \cos a}{\cot a} = \frac{\sqrt{1 - (\cos a)^2}}{\cos a} \\
 &= \frac{2 \tan c}{1 - (\tan c)^2} = \frac{2 \cot c}{(\cot c)^2 - 1} = \frac{2}{\cot c - \tan c} = \frac{1 - \cos 2a}{\sin 2a} \\
 &= \cot a - 2 \cot 2a = \frac{\sin 2a}{1 + \cos 2a} = \sqrt{\frac{1 - \cos 2a}{1 + \cos 2a}}
 \end{aligned}$$

$$(4.) \quad \cot a = \sqrt{(\operatorname{cosec} a)^2 - 1} = \frac{\cos a}{\sin a} = \frac{1}{\tan a} = \text{the reciprocals of the above expressions for the tangent.}$$

$$(5.) \quad \sec a = \sqrt{1 + (\tan a)^2} = \frac{\tan a}{\sin a} = \frac{1}{\cos a} = \text{the reciprocals of the above expressions for the cosine.}$$

$$(6.) \quad \operatorname{Cosec} a = \sqrt{1 + (\cot a)^2} = \frac{\sec a}{\tan a} = \sec a \cdot \cot a = \frac{1}{\sin a} = \text{the reciprocals of the above expressions for the sine.}$$

$$(7.) \quad \operatorname{Versin} a = \frac{(\sin a)^2}{1 + \cos a}.$$

$$(8.) \quad \operatorname{Coverain} a = \frac{(\cos a)^2}{1 + \sin a}.$$

TABLE XXII.—EXPRESSIONS FOR MULTIPLE ARCS.

- (1.) $\sin \frac{1}{2} a = \sqrt{\frac{1 - \cos a}{2}}.$
- (2.) $\sin 2 a = 2 \sin a \cdot \cos a.$
- (3.) $\sin 3 a = 3 \sin a - 4 (\sin a)^3.$
- (4.) $\sin 4 a = \cos a \{ 4 \sin a - 8 (\sin a)^3 \}.$
- (5.) $\sin 5 a = 5 \sin a - 20 (\sin a)^3 + 16 (\sin a)^5.$
- (6.) $\sin n a = 2^{n-1} \cdot \sin \beta \cdot \sin \left(\beta + \frac{\pi}{n} \right) \cdot \sin \left(\beta + \frac{2\pi}{n} \right) + \&c.$
- (7.)
$$\begin{aligned} = \cos a \{ & (2 \sin a)^{n-1} - \frac{n-2}{1} (2 \sin a)^{n-3} \\ & + \frac{(n-3) \cdot (n-4)}{1 \cdot 2} (2 \sin a)^{n-5} \\ & - \frac{(n-4) \cdot (n-5) \cdot (n-6)}{1 \cdot 2 \cdot 3} (2 \sin a)^{n-7} + \&c. \end{aligned}$$
- (8.) $\cos \frac{1}{2} a = \sqrt{\frac{1 + \cos a}{2}}.$
- (9.) $\cos 2 a = 2 (\cos a)^2 - 1.$
- (10.) $\cos 3 a = 4 (\cos a)^3 - 3 \cos a.$
- (11.) $\cos 4 a = 8 (\cos a)^4 - 8 (\cos a)^2 + 1.$
- (12.) $\cos 5 a = 16 (\cos a)^5 - 20 (\cos a)^3 + 5 \cos a.$
- (13.)
$$\begin{aligned} \cos n a = \frac{1}{2} \{ & (2 \sin a)^n - n (2 \sin a)^{n-2} + \frac{n(n-3)}{1 \cdot 2} (2 \sin a)^{n-4} \\ & - \frac{n(n-4) \cdot (n-5)}{1 \cdot 2 \cdot 3} (2 \sin a)^{n-6} + \&c. \} \end{aligned}$$
- (14.) $\tan \frac{a}{2} = \frac{\tan a}{1 + \sqrt{1 + (\tan a)^2}}.$
- (15.) $\tan 2 a = \frac{2 \tan a}{1 - (\tan a)^2}.$
- (16.) $\tan 3 a = \frac{3 \tan a - (\tan a)^3}{1 - 3 (\tan a)^2}.$
- (17.) $\tan 4 a = \frac{4 \tan a - 4 (\tan a)^3}{1 - 6 (\tan a)^2 + (\tan a)^4}.$
- (18.) $\tan 5 a = \frac{5 \tan a - 10 (\tan a)^3 + (\tan a)^5}{1 - 10 (\tan a)^2 + 5 (\tan a)^4}.$
- (19.) $\cot \frac{a}{2} = \frac{1}{\sqrt{1 + (\cot a)^2} - \cot a}.$
- (20.) $\cot 2 a = \frac{(\cot a)^2 - 1}{2 \cot a}.$
- (21.) $\cot 3 a = \frac{(\cot a)^3 - 3 \cot a}{3 (\cot a)^2 - 1}.$
- (22.) $\cot 4 a = \frac{(\cot a)^4 - 6 (\cot a)^2 + 1}{4 (\cot a)^3 - 4 \cot a}.$
- (23.) $\cot 5 a = \frac{(\cot a)^5 - 10 (\cot a)^3 + 5 \cot a}{5 (\cot a)^4 - 10 (\cot a)^2 + 1}.$

TABLE XXIII.—FORMULÆ RELATING TO TWO ARCS OR ANGLES.

- (1.) $\sin (\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta.$
- (2.) $\sin (\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta.$
- (3.) $\cos (\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta.$
- (4.) $\cos (\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta.$
- (5.) $\tan (\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \cdot \tan \beta}.$
- (6.) $\tan (\alpha - \beta) = \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \cdot \tan \beta}.$
- (7.) $\cot (\alpha + \beta) = \frac{\cot \alpha \cdot \cot \beta - 1}{\cot \beta + \cot \alpha}.$
- (8.) $\cot (\alpha - \beta) = \frac{\cot \alpha \cdot \cot \beta + 1}{\cot \beta - \cot \alpha}.$
- (9.) $\sin (\alpha + \beta) \cdot \sin (\alpha - \beta) = (\sin \alpha)^2 - (\sin \beta)^2 = (\cos \beta)^2 - (\cos \alpha)^2.$
- (10.) $\cos (\alpha + \beta) \cdot \cos (\alpha - \beta) = (\cos \alpha)^2 - (\sin \beta)^2 = (\cos \beta)^2 - (\sin \alpha)^2.$
- (11.) $\frac{\sin (\alpha + \beta)}{\sin (\alpha - \beta)} = \frac{\tan \alpha + \tan \beta}{\tan \alpha - \tan \beta} = \frac{\cot \beta + \cot \alpha}{\cot \beta - \cot \alpha}.$
- (12.) $\frac{\cos (\alpha + \beta)}{\cos (\alpha - \beta)} = \frac{\cot \beta - \tan \alpha}{\cot \beta + \tan \alpha} = \frac{\cot \alpha - \tan \beta}{\cot \alpha + \tan \beta}.$
- (13.) $\sin \alpha + \sin \beta = 2 \sin \frac{1}{2} (\alpha + \beta) \cdot \cos \frac{1}{2} (\alpha - \beta).$
- (14.) $\sin \alpha - \sin \beta = 2 \sin \frac{1}{2} (\alpha - \beta) \cdot \cos \frac{1}{2} (\alpha + \beta).$
- (15.) $\cos \alpha + \cos \beta = 2 \cos \frac{1}{2} (\alpha + \beta) \cdot \cos \frac{1}{2} (\alpha - \beta).$
- (16.) $\cos \alpha - \cos \beta = 2 \sin \frac{1}{2} (\alpha - \beta) \cdot \sin \frac{1}{2} (\alpha + \beta).$
- (17.) $\tan \alpha + \tan \beta = \frac{\sin (\alpha + \beta)}{\cos \alpha \cdot \cos \beta}.$
- (18.) $\tan \alpha - \tan \beta = \frac{\sin (\alpha - \beta)}{\cos \alpha \cdot \cos \beta}.$
- (19.) $\cot \alpha + \cot \beta = \frac{\sin (\alpha + \beta)}{\sin \alpha \cdot \sin \beta}.$
- (20.) $\cot \alpha - \cot \beta = \frac{\sin (\alpha - \beta)}{\sin \alpha \cdot \sin \beta}.$
- (21.) $2 \sin \alpha \cdot \cos \beta = \sin (\alpha + \beta) + \sin (\alpha - \beta).$
- (22.) $2 \cos \alpha \cdot \sin \beta = \sin (\alpha + \beta) - \sin (\alpha - \beta).$
- (23.) $2 \cos \alpha \cdot \cos \beta = \cos (\alpha + \beta) + \cos (\alpha - \beta).$
- (24.) $2 \sin \alpha \cdot \sin \beta = \cos (\alpha - \beta) - \cos (\alpha + \beta).$
- (25.) $\tan (\alpha + \beta + \gamma) = \frac{\tan (\alpha + \beta) + \tan \gamma}{1 - \tan (\alpha + \beta) \cdot \tan \gamma}$
 $= \frac{\tan \alpha + \tan \beta + \tan \gamma - \tan \alpha \cdot \tan \beta \cdot \tan \gamma}{1 - \tan \alpha \cdot \tan \beta - \tan \alpha \cdot \tan \gamma - \tan \beta \cdot \tan \gamma}.$

If $\alpha + \beta + \gamma = \pi.$

$$(26.) \tan \alpha + \tan \beta + \tan \gamma = \tan \alpha \cdot \tan \beta \cdot \tan \gamma.$$

TABLE XXIV.—TRIGONOMETRICAL EXPRESSIONS.

Expressions for the sin, cos, tan, and cot, in terms of the arc a .

$$(1.) \sin a = a - \frac{a^3}{1 \cdot 2 \cdot 3} + \frac{a^5}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} - \frac{a^7}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7} + \&c.$$

$$= a \left(1 - \frac{a^2}{2^2}\right) \cdot \left(1 - \frac{a^2}{4^2}\right) \cdot \left(1 - \frac{a^2}{6^2}\right) \cdot \&c.$$

$$(2.) \cos a = 1 - \frac{a^2}{1 \cdot 2} + \frac{a^4}{1 \cdot 2 \cdot 3 \cdot 4} - \frac{a^6}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6} + \&c.$$

$$= \left(1 - \frac{a^2}{2^2}\right) \cdot \left(1 - \frac{a^2}{4^2}\right) \cdot \left(1 - \frac{a^2}{6^2}\right) \cdot \&c.$$

$$(3.) \tan a = \frac{8a}{\pi^2 - 4a^2} + \frac{8a}{9\pi^2 - 4a^2} + \frac{8a}{25\pi^2 - 4a^2} + \&c.$$

$$(4.) \cot a = \frac{1}{a} - \frac{2a}{\pi^2 - a^2} - \frac{2a}{4\pi^2 - a^2} - \&c.$$

Expressions for the arc in terms of the sin and tan.

$$(5.) \text{Arc } a = \sin a + \frac{(\sin a)^3}{1 \cdot 2 \cdot 3} + \frac{1 \cdot 3 \cdot (\sin a)^5}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} + \&c.$$

$$(6.) \text{Arc } a = \tan a - \frac{(\tan a)^3}{3} + \frac{(\tan a)^5}{5} - \&c.$$

Expressions for the powers of the sin and cos.

$$(7.) 2(\sin a)^2 = 1 - \cos 2a,$$

$$(8.) 4(\sin a)^3 = 3 \sin a - \sin 3a,$$

$$(9.) 8(\sin a)^4 = 3 - 4 \cos 2a + \cos 4a,$$

$$(10.) 16(\sin a)^5 = \sin 5a - 5 \sin 3a + 10 \sin a,$$

$$(11.) 2^n (\sin a)^n = \pm 2 \sin na \mp 2n \cdot \sin(n-2)a \pm \frac{2n(n-1)}{1 \cdot 2} \sin(n-4)a$$

$$+ \frac{2n(n-1) \cdot (n-2)}{1 \cdot 2 \cdot 3} \sin(n-6)a \pm \&c.$$

$$(12.) \text{Or, } 2^n (\sin a)^n = \pm 2 \cos na \mp 2n \cdot \cos(n-2)a \pm \frac{2n(n-1)}{1 \cdot 2} \cos(n-4)a$$

$$+ \frac{2n(n-1) \cdot (n-2)}{1 \cdot 2 \cdot 3} \cos(n-6)a \pm \&c.$$

When n is of the form $4m+1$, use series (11) with the upper signs.

"	n	"	$4m-1$,	"	(11)	"	lower signs.
---	-----	---	----------	---	------	---	--------------

"	n	"	$4m$,	"	(12)	"	upper signs.
---	-----	---	--------	---	------	---	--------------

"	n	"	$4m+2$,	"	(12)	"	lower signs.
---	-----	---	----------	---	------	---	--------------

$$(13.) 2(\cos a)^2 = \cos 2a + 1,$$

$$(14.) 4(\cos a)^3 = \cos 3a + 3 \cos a,$$

$$(15.) 8(\cos a)^4 = \cos 4a + 4 \cos 2a + 3,$$

$$(16.) 16(\cos a)^5 = \cos 5a + 5 \cos 3a + 10 \cos a.$$

$$(17.) 2^n (\cos a)^n = 2 \cos na + 2n \cdot \cos(n-2)a + \frac{2n(n-1)}{1 \cdot 2} \cos(n-4)a$$

$$+ \frac{2n(n-1) \cdot (n-2)}{1 \cdot 2 \cdot 3} \cos(n-6)a + \&c.$$

The formula ending in $\frac{2n(n-1) \cdot (n-2) \cdot \&c.}{1 \cdot 2 \cdot 3 \cdot \&c.} \cos(n-n)a$, or in $\frac{2n(n-1) \cdot (n-2) \cdot \&c.}{1 \cdot 2 \cdot 3 \cdot \&c.} \cos a$, according as n is an even or an odd numberand in the former case half the expression is to be taken for the last $\&c.$

TABLE XXV.—FORMULÆ FOR SOLVING ALL THE CASES
OF A RECTILINEAL TRIANGLE, OF WHICH THREE PARTS ARE KNOWN.

Value of any side, as A.

$$(1.) A = \frac{B \cdot \sin \alpha}{\sin \beta}.$$

$$(2.) = \frac{C \cdot \sin \alpha}{\sin \gamma}.$$

$$(3.) = \frac{B}{\cos \gamma + \sin \gamma \cdot \cot \alpha}$$

$$(4.) = \frac{C}{\cos \beta + \sin \beta \cdot \cot \alpha}.$$

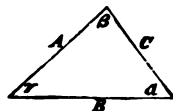
$$(5.) = B \cdot \cos \gamma + B \cdot \sin \gamma \cdot \cot \beta.$$

$$(6.) = C \cdot \cos \beta + C \cdot \sin \beta \cdot \cot \gamma.$$

$$(7.) = \sqrt{B^2 + C^2 - 2 B \cdot C \cdot \cos \alpha}.$$

$$(8.) = B \cdot \cos \gamma \pm \sqrt{\{C^2 - B^2 \cdot (\sin \gamma)^2\}}.$$

$$(9.) = C \cdot \cos \beta \pm \sqrt{\{B^2 - C^2 (\sin \beta)^2\}}$$



Value of the sin of any angle, as β .

$$(10.) \sin \beta = \frac{B \cdot \sin \alpha}{A}.$$

$$(11.) = \frac{B \cdot \sin \gamma}{C}$$

$$(12.) = \sin (\gamma + \alpha)$$

$$(13.) = \sin \gamma \cdot \cos \alpha + \cos \gamma \cdot \sin \alpha.$$

$$(14.) = \frac{B \cdot \sin \alpha}{\sqrt{B^2 + C^2 - 2 B \cdot C \cdot \cos \alpha}}.$$

$$(15.) = \frac{B \cdot \sin \gamma}{\sqrt{B^2 + A^2 - 2 B \cdot A \cdot \cos \gamma}}.$$

$$(16.) = \sqrt{1 - \left(\frac{A^2 + C^2 - B^2}{2 A \cdot C} \right)^2}$$

$$(17.) = \frac{\sin \alpha \{C \cdot \cos \alpha \pm \sqrt{A^2 - C^2 \cdot (\sin \alpha)^2}\}}{A}.$$

$$(18.) = \frac{\sin \gamma \{A \cdot \cos \gamma \pm \sqrt{C^2 - A^2 \cdot (\sin \gamma)^2}\}}{C}$$

EQUATIONS OF THE SECOND DEGREE.

(1.) $x^2 + px = q.$

Let $\tan \alpha = \frac{2}{p} \sqrt{q},$

Root $x = \sqrt{q} \cdot \tan \frac{1}{2} \alpha,$

and Root $x = -\sqrt{q} \cdot \cot \frac{1}{2} \alpha.$

(2.) $x^2 - px = q.$

$\tan \alpha = \frac{2}{p} \sqrt{q},$

$x = -\sqrt{q} \cdot \tan \frac{1}{2} \alpha,$

$x = \sqrt{q} \cdot \cot \frac{1}{2} \alpha.$

(5.) $x^2 + px + q = 0.$

Let $\tan \alpha = \frac{p}{3q} \sqrt{\frac{p}{3}}$

Let $\tan \beta = \sqrt[3]{\tan \frac{1}{2} \alpha},$

Only real root $x = -2\sqrt{\frac{p}{3}} \cdot \cot 2\beta.$

(6.) $x^2 + px - q = 0.$

$\tan \alpha = \frac{p}{3q} \sqrt{\frac{p}{3}}$

$\tan \beta = \sqrt[3]{\tan \frac{1}{2} \alpha},$

$x = 2\sqrt{\frac{p}{3}} \cdot \cot 2\beta.$

(7.) $x^2 - px + q = 0.$

$\sin \alpha = \frac{p}{3q} \sqrt{\frac{p}{3}}$

$\tan \alpha = \sqrt[3]{\tan \frac{1}{2} \alpha},$

$x = -\frac{2\sqrt{\frac{p}{3}}}{\sin 2\beta}.$

EQUATIONS OF THE THIRD DEGREE.

(8.) $x^2 - px - q = 0.$

$\sin \alpha = \frac{p}{3q} \sqrt{\frac{p}{3}}$

$\tan \alpha = \sqrt[3]{\tan \frac{1}{2} \alpha},$

$x = \frac{2\sqrt{\frac{p}{3}}}{\sin 2\beta}.$

(10.) $x^2 + xp - q = 0.$

$\sin 3\alpha = \frac{3q}{p} \cdot \frac{1}{2\sqrt{\frac{p}{3}}}$

When $4p^3 >$ or $= 27q^2$, the following will be the solution of the two last cases

Root $x = 2\sqrt{\frac{p}{3}} \cdot \sin \alpha.$

2nd root $x = 2\sqrt{\frac{p}{3}} \cdot \sin (60^\circ - \alpha).$

3rd root $x = -2\sqrt{\frac{p}{3}} \cdot \sin (60^\circ + \alpha).$

(4.) $x^2 - px = -q.$

$\sin \alpha = \frac{2}{p} \sqrt{q},$

$x = \sqrt{q} \cdot \tan \frac{1}{2} \alpha,$

$x = \sqrt{q} \cdot \cot \frac{1}{2} \alpha.$

If $p^3 \wedge 4q,$
is imaginary.

When $4p^3 \wedge 27q^2.$

$x = -2\sqrt{\frac{p}{3}} \cdot \sin \alpha.$

$x = -2\sqrt{\frac{p}{3}} \cdot \sin (60^\circ - \alpha).$

$x = 2\sqrt{\frac{p}{3}} \cdot \sin (60^\circ + \alpha).$

TABLE XXVII.—DIFFERENTIAL COEFFICIENTS.

Value of u .	Value of $\frac{du}{dx}$.
(1.) x .	1.
(2.) πx .	π .
(3.) x^n .	πx^{n-1} .
(4.) $\log_b x$.	$\frac{m}{x}$ { in which m is the modulus of the system of logarithms.
(5.) $\log_1 x$.	$\frac{1}{x}$ [$\epsilon = 2.7182818$].
(6.) a^x .	$a^x \log_e a$.
(7.) $\sin x$.	$\cos x$.
(8.) $\cos x$.	$-\sin x$.
(9.) $\tan x$.	$\frac{1}{(\cos x)^2}$.
(10.) $\cot x$.	$-\frac{1}{(\sin x)^2}$.
(11.) $(\sin x)^2$.	$2 \sin x \cdot \cos x$.
(12.) $(\cos x)^2$.	$-2 \sin x \cdot \cos x$.
(13.) $(\tan x)^2$.	$\frac{2 \tan x}{(\cos x)^2}$.
(14.) $(\cot x)^2$.	$\frac{2 \cot x}{(\sin x)^2}$.
(15.) $\sin^{-1} x$.	$\frac{1}{\sqrt{1-x^2}}$.
(16.) $\cos^{-1} x$.	$-\frac{1}{\sqrt{1-x^2}}$.
(17.) $\tan^{-1} x$.	$\frac{1}{1+x^2}$.
(18.) $\phi x \pm \psi x$.	$\frac{d(\phi x)}{dx} \pm \frac{d(\psi x)}{dx}$.
(19.) $\frac{\phi x}{\psi x}$.	$\frac{\psi x \cdot \frac{d(\phi x)}{dx} - \phi x \cdot \frac{d(\psi x)}{dx}}{(\psi x)^2}$.
(20.) $f x \cdot \phi x \cdot \psi x$.	$\phi x \cdot \psi x \cdot \frac{d(f x)}{dx} + f x \cdot \psi x \cdot \frac{d(\phi x)}{dx}$ $+ f x \cdot \phi x \cdot \frac{d(\psi x)}{dx}$.
(21.) ϕv , in which $v = \psi x$.	$\frac{d\phi(\psi x)}{d\psi x} \cdot \frac{d\psi x}{dx}$.

TABLE XXVIII.
USEFUL NUMBERS, WITH THEIR LOGARITHMS.

	Number.	Logarithm.	Complement of Logarithm.
Circumference of a circle } whose dia. = 1 . . . } = π =	3'1415927	0'4971499	9'5028501
Area of the same . . . = $\frac{\pi}{4}$ =	0'7853982	1'8950899	10'1049101
Diameter of a circle } whose area = 1 } = $\sqrt{\frac{4}{\pi}}$ =	1'1283792	0'0524551	9'9475449
Surface of a sphere whose } dia. = 1 } = π =	3'1415927	0'4971499	9'5028501
Solidity of the same . . . = $\frac{\pi}{6}$ =	0'5235988	1'7189986	10'2810014
Diameter of a sphere } whose solidity = 1 } = $\sqrt[3]{\frac{6}{\pi}}$ =	1'2407010	0'0936672	9'9063328
Length of arc 1" = sin 1" (rad.) being unity } =	0'000004848	6'6855749	15'3144251
Length of arc 2" = sin 2" (rad.) being unity } =	0'000009696	6'9866049	15'0133951
Length of arc 3" = sin 3" (rad.) being unity } =	0'000014544	5'1626961	14'8373039
Length of arc 1' = sin 1' (rad.) being unity } =	0'000290888	4'4637261	13'5362739
Length of arc 1° (rad being unity) =	0'017453293	2'2418774	11'7581226
Length of sin 1° (rad being unity) =	0'017452406	2'2418553	11'7581447
Radius reduced to seconds . . =	206264'8	5'3144251	4'6855749
" " to minutes . . =	3437'74677	3'5362739	6'4637261
" " to degrees . . =	57'295780	1'7581226	8'2418774
360 degrees expressed in seconds =	1296000	6'1126050	3'8873940
12 hours expressed in seconds =	43200	4'6354837	5'3645163
24 hours expressed in seconds =	86400	4'9365137	5'0634863
No. whose hyperbolic loga- rithm is 1 } =	2'718281829	0'4342944	9'5437056
Modulus of common logarithms =	434294482	1'6377843	10'3622157
No. of French metres in a toise . =	1'949040	0'2898127	9'7101873
No. of English yards in a French toise } =	2'1315308	0'3286916	9'6713084
No. of English feet in a French toise } =	6'3945925	0'8058128	9'1941872
No. of English yards in a French metre } =	1'0936331	0'0388716	9'8611284
No. of English feet in a French metre } =	3'2808992	0'5159929	9'4840071
No. of English inches in a French metre } =	39'37079	1'5951742	8'4048258
No. of English feet in a French foot =	1'0657654	0'0276616	9'9723384
No. of English acres in a French are =	0'02471143	2'3928978	11'6071022
No. of imp. lbs. Troy in a French gramme } =	0'00268098	3'4282936	12'571706

TABLE XXVIII.
USEFUL NUMBERS, WITH THEIR LOGARITHMS.

	Number.	Logarithm.	Complement of Logarithm.
No. of imp. lbs. Avoird. in a French gramme	= 0'00220606	3'3436173	12'6563827
No. of English cwt. in a French kilogramme	= 0'0196969	2'2943979	11'7056021
No. of imp. gallons in a French litre	= 0'22009687	1'3426137	10'6573863
No. of Sexagesimal degrees in a Centesimal degree	= 0'9	1'9542425	10'0457575
No. of Sexagesimal minutes in a Centesimal minute	= 0'54	1'7323938	10'2676062
No. of Sexagesimal seconds in a Centesimal second	= 0'324	1'5105450	10'4894540
Weight of a cubic foot of pure water in lbs. Avoird. the Bar. being 30, and the Ther. 62°	= 62'3210606	1'7946348	8'2053652
Length in inches of a pendulum which vibrates seconds in the latitude of Greenwich . . .	= 39'1393	1'5926130	8'4073860
Velocity (in feet per second) acquired in a second by a body falling in vacuo in the lat. of Greenwich . . .	= $g = 32'19084$	1'5077222	8'4922778
No. of cubic inches in an imperial gallon	= 277'274	2'4429092	7'5570908
No. of feet in a statute mile	= 5280	3'7226339	6'2773661
No. of feet in a geographical or nautical mile	= 6075'6	3'7835892	6'2164108
Diurnal acceleration of stars (= 3 ^m 55' 9093) expressed in mean solar seconds	= 235'9093	2'3727441	8'6272559
Sidereal day (= 23 ^h 56 ^m 4' 09) expressed in mean solar days	= 0'99726967	1'9988127	10'0011873
Mean solar day (= 24 ^h 3 ^m 56' 5554) expressed in sidereal days .	= 1'00273791	0'0011874	9'9988126
Sidereal revolution of Earth expressed in mean solar days .	= 365'25636	2'5625978	7'4374022
Tropical revolution of Earth expressed in mean solar days .	= 365'24224	2'5625910	7'4374080
Earth's equatorial radius expressed in feet	= 20921665	7'3205963	2'6794037
Earth's polar radius expressed in feet	= 20852394	7'3191559	2'6808441
Compression of the Earth . . .	= $\frac{1}{302}$	3'5199931	12'4800069
Length of a degree of latitude in feet at the Equator	= 362732	5'5595859	4'4404141
Length of a degree of latitude in feet in latitude 45°	= 364543'5	5'5617494	4'4382506

Long.	Sun's Declination.																			Time from Noon.	
	0°	2°	4°	6°	8°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°	23°		23° 15'
1	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0
2	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0
3	0	8	0	8	0	8	0	8	0	7	0	7	0	6	0	6	0	5	0	5	0
4	0	12	0	12	0	11	0	11	0	10	0	10	0	9	0	9	0	8	0	8	0
5	0	16	0	16	0	15	0	15	0	14	0	14	0	13	0	13	0	12	0	12	0
6	0	20	0	20	0	19	0	19	0	18	0	18	0	17	0	17	0	16	0	16	0
7	0	24	0	24	0	23	0	23	0	22	0	22	0	21	0	21	0	20	0	20	0
8	0	28	0	28	0	26	0	26	0	25	0	25	0	24	0	24	0	23	0	23	0
9	0	32	0	32	0	30	0	30	0	29	0	29	0	28	0	28	0	27	0	27	0
10	0	36	0	36	0	34	0	34	0	32	0	32	0	31	0	31	0	30	0	30	0
11	0	40	0	40	0	38	0	38	0	36	0	36	0	34	0	34	0	33	0	33	0
12	0	44	0	44	0	42	0	42	0	40	0	40	0	38	0	38	0	37	0	37	0
13	0	48	0	48	0	46	0	46	0	44	0	44	0	42	0	42	0	41	0	41	0
14	0	52	0	52	0	50	0	50	0	48	0	48	0	46	0	46	0	45	0	45	0
15	0	56	0	56	0	54	0	54	0	52	0	52	0	50	0	50	0	49	0	49	0
16	0	60	0	60	0	58	0	58	0	56	0	56	0	54	0	54	0	53	0	53	0
17	0	64	0	64	0	62	0	62	0	60	0	60	0	58	0	58	0	57	0	57	0
18	0	68	0	68	0	66	0	66	0	64	0	64	0	62	0	62	0	61	0	61	0
19	0	72	0	72	0	70	0	70	0	68	0	68	0	66	0	66	0	65	0	65	0
20	0	76	0	76	0	74	0	74	0	72	0	72	0	70	0	70	0	69	0	69	0
21	0	80	0	80	0	78	0	78	0	76	0	76	0	74	0	74	0	73	0	73	0
22	0	84	0	84	0	82	0	82	0	80	0	80	0	78	0	78	0	77	0	77	0
23	0	88	0	88	0	86	0	86	0	84	0	84	0	82	0	82	0	81	0	81	0
24	0	92	0	92	0	90	0	90	0	88	0	88	0	86	0	86	0	85	0	85	0
25	0	96	0	96	0	94	0	94	0	92	0	92	0	90	0	90	0	89	0	89	0
26	0	100	0	100	0	98	0	98	0	96	0	96	0	94	0	94	0	93	0	93	0
27	0	104	0	104	0	102	0	102	0	100	0	100	0	98	0	98	0	97	0	97	0
28	0	108	0	108	0	106	0	106	0	104	0	104	0	102	0	102	0	101	0	101	0
29	0	112	0	112	0	110	0	110	0	108	0	108	0	106	0	106	0	105	0	105	0
30	0	116	0	116	0	114	0	114	0	112	0	112	0	110	0	110	0	109	0	109	0
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32	0	124	0	124	0	122	0	122	0	120	0	120	0	118	0	118	0	117	0	117	0
33	0	128	0	128	0	126	0	126	0	124	0	124	0	122	0	122	0	121	0	121	0
34	0	132	0	132	0	130	0	130	0	128	0	128	0	126	0	126	0	125	0	125	0
35	0	136	0	136	0	134	0	134	0	132	0	132	0	130	0	130	0	129	0	129	0
36	0	140	0	140	0	138	0	138	0	136	0	136	0	134	0	134	0	133	0	133	0
37	0	144	0	144	0	142	0	142	0	140	0	140	0	138	0	138	0	137	0	137	0
38	0	148	0	148	0	146	0	146	0	144	0	144	0	142	0	142	0	141	0	141	0
39	0	152	0	152	0	150	0	150	0	148	0	148	0	146	0	146	0	145	0	145	0
40	0	156	0	156	0	154	0	154	0	152	0	152	0	150	0	150	0	149	0	149	0
41	0	160	0	160	0	158	0	158	0	156	0	156	0	154	0	154	0	153	0	153	0
42	0	164	0	164	0	162	0	162	0	160	0	160	0	158	0	158	0	157	0	157	0
43	0	168	0	168	0	166	0	166	0	164	0	164	0	162	0	162	0	161	0	161	0
44	0	172	0	172	0	170	0	170	0	168	0	168	0	166	0	166	0	165	0	165	0
45	0	176	0	176	0	174	0	174	0	172	0	172	0	170	0	170	0	169	0	169	0
46	0	180	0	180	0	178	0	178	0	176	0	176	0	174	0	174	0	173	0	173	0
47	0	184	0	184	0	182	0	182	0	180	0	180	0	178	0	178	0	177	0	177	0
48	0	188	0	188	0	186	0	186	0	184	0	184	0	182	0	182	0	181	0	181	0
49	0	192	0	192	0	190	0	190	0	188	0	188	0	186	0	186	0	185	0	185	0
50	0	196	0	196	0	194	0	194	0	192	0	192	0	190	0	190	0	189	0	189	0
51	0	200	0	200	0	198	0	198	0	196	0	196	0	194	0	194	0	193	0	193	0
52	0	204	0	204	0	202	0	202	0	200	0	200	0	198	0	198	0	197	0	197	0
53	0	208	0	208	0	206	0	206	0	204	0	204	0	202	0	202	0	201	0	201	0
54	0	212	0	212	0	210	0	210	0	208	0	208	0	206	0	206	0	205	0	205	0
55	0	216	0	216	0	214	0	214	0	212	0	212	0	210	0	210	0	209	0	209	0
56	0	220	0	220	0	218	0	218	0	216	0	216	0	214	0	214	0	213	0	213	0
57	0	224	0	224	0	222	0	222	0	220	0	220	0	218	0	218	0	217	0	217	0
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62	0	244	0	244	0	242	0	242	0	240	0	240	0	238	0	238	0	237	0	237	0
63	0	248	0	248	0	246	0	246	0	244	0	244	0	242	0	242	0	241	0	241	0
64	0	252	0	252	0	250	0	250	0	248	0	248	0	246	0	246	0	245	0	245	0
65	0	256	0	256	0	254	0	254	0	252	0	252	0	250	0	250	0	249	0	249	0
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69	0	272	0	272	0	270	0	270	0	268	0	268	0	266	0	266	0	265	0	265	0
70	0	276	0	276	0	274	0	274	0	272	0	272	0	270	0	270	0	269	0	269	0
71	0	280	0	280	0	278	0	278	0	276	0	276	0	274	0	274	0	273	0	273	0
72	0	284	0	284	0	282	0	282	0	280	0	280	0	278	0	278	0	277	0	277	0
73	0	288	0	288	0	286	0	286	0	284	0	284	0	282	0	282	0	281	0	281	0
74	0	292	0	292	0	290	0	290	0	288	0	288	0	286	0	286	0	285	0	285	0
75	0	296	0	296	0	294	0	294	0	292	0	292	0	290	0	290	0	289	0	289	0
76	0	300	0	300	0	298	0	298	0	296	0	296	0	294	0	294	0	293	0	293	0
77	0	304	0	304	0	302	0	302	0	300	0	300	0	298	0	298	0	297	0	297	0
78	0	308	0	308	0	306	0	306	0	304	0	304	0	302	0	302	0	301	0	301	0
79	0	312	0	312	0	310	0	310	0	308	0	308	0	306	0	306	0	305	0	305	0
80	0	316	0	316	0	314	0	314	0	312	0										

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TABLES
INTENDED TO FACILITATE THE OPERATIONS OF
NAVIGATION
AND
NAUTICAL ASTRONOMY

By J. R. YOUNG

FORMERLY PROFESSOR OF MATHEMATICS IN BELFAST COLLEGE

New Edition



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MATHEMATICAL TABLES

FOR

TRIGONOMETRICAL, ASTRONOMICAL, AND NAUTICAL
CALCULATIONS

TO WHICH IS PREFIXED

A TREATISE ON LOGARITHMS

By HENRY LAW

MEMBER OF THE INSTITUTION OF CIVIL ENGINEERS, ETC. ETC.

NEW AND REVISED EDITION

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TABLES

FOR

NAVIGATION AND NAUTICAL ASTRONOMY.

EXPLANATION OF THE TABLES.

THE following Tables are intended to be used conjointly with the "Mathematical Tables"—published in the series of Rudimentary Treatises—in the various computations of Navigation and Nautical Astronomy. They are eleven in number, and the purposes they serve will be readily understood from the following brief explanation :

TABLES 1 AND 2.

Sines, Cosines, &c., to every Quarter Point of the Compass.

The first of these Tables exhibits the *Natural* sines, cosines, &c., of *Courses* to every quarter-point of the compass, and the second furnishes the *Logarithmic* sines, cosines, &c. of the same angles. Here are two examples of their use :

1. A ship from latitude $87^{\circ} 8' \text{ N.}$, sails S.W. $\frac{1}{4}$ S. a distance of 148 miles ; required the latitude in and the departure made ?

BY TABLE 1.

<i>For the diff. lat.</i>	
Diff. lat. = cos course \times dist.	
cos course, $3\frac{1}{2}$ points =	773
distance =	148
	<hr/> 6184
	3092
	<hr/> 773
diff. lat. S. =	114° 40'
	= 1° 54' S.
lat. left .	37 3 N.
lat. in .	<hr/> 35 9 N.

<i>For the departure.</i>	
Dep. = sin course \times dist.	
sin course, $3\frac{1}{2}$ points =	6343
distance =	148
	<hr/> 50744
	25372
	<hr/> 6343
departure W. =	93° 8764
Hence the departure is 93° 9 miles W.	

BY TABLE 2.

<i>For the diff. lat.</i>	
Diff. lat. = cos course \times dist.	
	<i>Logs.</i>
cos course, $3\frac{1}{2}$ points =	9.88818
distance = 148 .	2.17026
	<hr/> diff. lat. S. = 114 . 2.05844
or diff. lat. =	1° 54' S.

<i>For the departure.</i>	
Dep. = sin course \times dist.	
	<i>Logs.</i>
sin course, $3\frac{1}{2}$ points =	9.80236
distance = 148 .	2.17026
	<hr/> departure = 93.9 . 1.97262
∴ the departure is 93.9 m. W.	

2. A ship sails from latitude $15^{\circ} 55'$ S. on a S.E. $\frac{1}{2}$ E course till she finds herself in latitude $18^{\circ} 49'$ S.: required the departure made?

BY TABLE 1.

<i>For the departure.</i>	
Dep. = tan course \times diff. lat.	
tan course, $4\frac{1}{2}$ points =	1.2185
diff. lat. =	174
	<hr/> 48740
	85295
	<hr/> 12185
departure E. =	<hr/> 212° 019

BY TABLE 2.

<i>For the departure.</i>	
Dep. = tan course \times diff. lat.	
	<i>Logs.</i>
tan course, $4\frac{1}{2}$ points =	10.08583
diff. lat. = 174 .	2.24055
	<hr/> departure = 212 E. 2.32638
Hence the departure is 212 miles E.	

TABLE 3.

Natural Sines, Cosines, Tangents, and Cotangents.

This is a table of natural sines, cosines, tangents, and cotangents to every degree and minute of the quadrant. It will be found useful in finding the direct course from the beginning to the end of a traverse, and in many other computations of Navigation and Trigonometry in which it may be inconvenient to employ logarithms. Ample illustration of the advantage of this table is given in the Navigation and Nautical Astronomy which accompanies the present volume.

TABLES 4 AND 5.

Difference of Latitude and Departure, or Traverse Table for Points and for Degrees.

On account of the use of these Tables in working a traverse, they are frequently called *Traverse Tables*. The difference of latitude and departure due to any course and distance are found from one or other of these Tables by *inspection*. The course stands at the head of the page, or if more than 45° , at the foot—expressed in points and quarter-points in Table 4, and in degrees in Table 5—and the difference of latitude and departure which the ship makes in running any distance on that course, from 1 mile to 300 miles is inserted in the body of the Table, and is found as in the examples following :

1. A ship sails N.W. $\frac{1}{4}$ N. a distance of 78 miles : required the difference of latitude and departure by inspection ?

The given course is $8\frac{1}{4}$ points ; and referring to Table 4, we find the page devoted to this course to be page 88.

which, against 78 in a column headed *Dist.*, stands 60·3 under the head *Lat.*, and 49·5 under the head *Dep.* We conclude therefore that, for the given course and distance, the difference of latitude is 60·3 miles, and the departure 49·5 miles.

2. Suppose the course to be $5\frac{1}{2}$ points, and the distance sailed 78 miles as before.

Then, as the course here exceeds four points, we look for it at the foot of the page (p. 34), and against 78 in the *distance* column, we find 68·8 in the adjacent *departure* column, and 36·8 in the *difference of latitude* column, so that the difference of latitude made is 36·8 miles, and the departure 68·8 miles.

3. Suppose the course to be 30° , and the distance sailed on that course 78 miles.

Then, turning to the page headed 30° in Table 5 (p. 70), we find against 78 in the *Dist.* column, the number 67·5 in the adjacent *Lat.* column, and 39 in the *Dep.* column: we conclude therefore that the difference of latitude made is 67·5 miles, and the corresponding departure 39 miles.

4. But if the course exceed 45° , if, for instance, it be 58° , it will be found at the bottom of the page (p. 72), and against the *distance* 78, there appears 66·1 for *departure*, and 41·3 for *difference of latitude*.

If the distance sailed on any course be greater than 300 miles, since the limits of the Table will then be exceeded, to render the Table still available we must take the half, or the third, or the fourth, &c., of the given distance, so that the part taken may be a distance within the limits of the Table: the diff. lat. and dep. corresponding to this aliquot part of the given distance, being each multiplied by 2, or by 3, or by 4, &c., according to the part taken, will give the *diff. lat. and dep.* due to the entire distance.

These Tables are employed not only in plane sailing, but also in parallel and mid-latitude sailings, as is sufficiently exemplified in the treatise on Navigation and Nautical Astronomy, to which the present collection is adapted. And in all computations of the parts of a right-angled triangle, provided the angles are expressed in degrees and minutes—seconds being disregarded, Table 5 may be used to save the trouble of arithmetical calculation.

TABLE 6.

Natural Cosines to Degrees, Minutes, and Seconds.

This Table is employed in the Author's method of clearing the lunar distance for the purpose of finding the longitude at sea. The several columns of cosines are headed by the degrees, the accompanying minutes being inserted in the first column on the left of the page: this is equally a column of the seconds, and is accordingly headed by the marks for minutes and seconds. As in the ordinary trigonometrical tables, the cosine of an arc or angle belonging to any number of degrees and minutes is found in the column of cosines, under the degrees, and in a horizontal line with the minutes found in the first column.

Suppose this cosine to have been extracted from the table; then, if there are seconds also in the arc or angle, we again refer to the same first column for these, and in the same horizontal line with them, and in the column headed "parts for " which immediately follows the column from which our cosine has been extracted, we shall find the correction for that cosine: this correction is always to be *subtracted*. The remainder will be the cosine of the given degrees, minutes, and seconds. But in taking out a cosine to degrees, minutes, and seconds, it will in general be

better to enter the marginal column first with the *seconds*, to write the "parts" for these on a slip of paper, and then, entering the same column with the minutes, instead of extracting the corresponding cosine, to place the slip under it, and subtract the correction written thereon. The Table extends from 0° to 90° only, so that it does not give immediately the cosines of obtuse angles: when therefore the angle is obtuse, we must enter the Table with the supplement of that angle, and regard the corresponding cosine as negative. It was thought better that this trifling amount of trouble should be incurred, than that the extent of the Table should be doubled.

There is indeed a way of avoiding this enlargement of the Table, and yet providing for the supplementary arcs; but as the Table would then have to be used in a peculiar manner—disturbing the general principle upon which the extracts from it are made in the other cases—it was thought preferable, after due consideration, to reject it. The plan is this. Suppose a marginal column added to the right of each page, for the minutes and seconds, proceeding upwards from 0 to 60, and that the degrees supplementary to those at the top of the page (one degree in each case being omitted in the supplement) were given at the bottom, as in the ordinary tables of sines and cosines; we should then have to use the table as in the following instance. Required the cosine of $115^\circ 41' 34''$? Referring to page 96, we should find 115° at the bottom of the column headed 64° , from which column opposite the $41'$ on the *right*, we should take the cosine 43397, then referring to the *left* for the $34''$, we should extract the "parts" 149, which we should have to *add* to 43397: we should thus get 433546 for the *required cosine*. As the Table at present stands, however, *we enter it with $64^\circ 18' 26''$, the supplement of $115^\circ 41' 34''$,*

and for $64^{\circ} 18'$ we find 433659, while the "parts" for $26''$ are found in a similar manner to be 113, which subtracted from 433659 gives 433546 for the required cosine.

It has not been thought necessary to insert the decimal point before each cosine; indeed, in the operation for which this Table is specially prepared, the numbers may always be regarded as integers. (See p. 227, Naut. Ast.)

Ex. 1. Suppose the natural cosine of $37^{\circ} 21' 33''$ were required:

Turning to the page containing 37° at the top (page 92), we find the "parts" against $33''$ to be 98, and the cosine against $21'$ to be 794944, subtracting the 98 from this, we write down 794846 for the cosine required.

2. Again, suppose we wanted the cosine of $118^{\circ} 16' 43''$:

Subtracting this from 180° , the angle in the Table is $61^{\circ} 43' 17''$. Under 61° , and against $17''$, the "parts" are 72, and against $43'$, the cosine is 473832: subtracting the 72 from this, we find 473760 for the required cosine, which is negative because the proposed angle is obtuse.

3. Required the angle whose cosine is 452801?

By the Table $452954 = \cos 63^{\circ} 4'$

Given cosine 452801

Parts for the secs. 153

35"

Hence the angle is $63^{\circ} 4' 35''$.

If the given cosine had been—452801, then the supplement of the angle thus determined, namely $116^{\circ} 55' 25''$, would have been the angle to which that cosine belongs.

TABLE 7.

Proportional Logarithms.

These are a peculiar kind of logarithms, first constructed by Dr. Maskelyne to facilitate the operation of finding the Greenwich time, at which a lunar distance taken at sea has place. They are also useful in many other inquiries, in which difference of time varies, as difference of angular measurement. When difference of time is required the Table is to be entered with difference of angular measurement, and when difference of angular measurement is required it is to be entered with the corresponding difference of time. Sufficient illustration of the mode of employing the Table is given in the Nautical Astronomy, pages 236-7.

The last four figures in the Table are decimals, and the greater part of the Table consists of these decimals alone; the decimal point however is suppressed, as well here as in the Nautical Almanac, since in finding the Greenwich time of a lunar distance the logarithms may be always regarded as whole numbers.

1. Suppose the proportional logarithm of $2^h 8^m 16^s$ is required, or the proportional logarithm of $2^\circ 8' 16''$: turning to the proper page of the Table (p. 112) we find that for each of these arguments the P. L. is $\cdot 1472$.

2. Suppose it be required to find the difference of time corresponding to the P. L. $\cdot 2954$: turning to page 109 we see that this P. L. answers to the difference of time, $1^h 31^m 10^s$. It also answers to the difference $1^\circ 31' 10''$ of angular measurement. The Table extends from 0^s to 3^h or 10800^s , or from $0''$ to 3° : the proportional logarithm of the extreme number of seconds, namely 10800, being 0, the formal insertion of it has not been thought necessary. For the

theory of proportional logarithms reference may be made to the Nautical Astronomy, page 235.

TABLE 8.

For determining the distance of an object seen in the horizon.

This Table shows the utmost distance at which an object on the surface of the sea can be seen by an eye elevated above it; the elevation of the eye being estimated in feet, and the distance in nautical miles, allowance being made for atmospherical refraction. If the object itself be elevated above the surface, and its summit be just visible in the remote distance, then, if the height of the distant object thus lost to sight all but its top, be previously known, the Table will enable us to find its distance, the height of the spectator's eye being known.

Ex. 1. From the mast head, 130 feet high, a boat was observed as a remote speck, just appearing in the horizon: required its distance?

In the Table opposite 130 feet is found 13·1 miles, the distance required.

2. From the same height the top of a lighthouse known to be 300 feet above the level of the sea, was discerned in the horizon: required the distance from the lighthouse?

For the height 130 the distance is 13·1 miles.

„	300	„	19·9
			<hr/>

∴ the distance of the lighthouse is 33 miles.

TABLE 9.

*For finding the mean time (nearly) of the Meridian Transits
of the Principal Fixed Stars.*

In this Table is recorded the mean time at which each of the 100 stars there selected passes the meridian of the ship. The times of transit are given only for every tenth day; but as the stars come to the meridian earlier every day, by a uniform difference of time—about *four* minutes—it is easy to find the time of transit on any intermediate day: we have only to multiply the number of days after the day of transit recorded in the Table by 4, and to subtract the number of minutes in the product from the time of transit on the day given in the Table. Or we may multiply the number of days *before* the next tabular day by 4, and add the resulting minutes to the time of that advanced day's transit: for example,

Suppose it were required to find the mean time of transit of α^2 Centauri on the fifth of November:

By the Table the time of transit Nov. 1, is $23^h 43^m$
And for four days afterwards, we subtract $4 \times 4 = 16$

\therefore time of transit Nov. 5th is $23 \quad 27$

Or, the time of transit Nov. 11, being by the Table $23^h 4^m$, by adding $6 \times 4 = 24$ minutes, we have for the time on Nov. 5th, $23^h 28^m$.

It will of course be understood that the times of transit furnished by aid of this Table, are only the times *nearly*; but in no case will the time differ from the truth by more than about two or three minutes, and the Table is therefore as *accurate as necessary* for the purpose intended by it, which

purpose is to apprise the mariner about what time he may expect certain well known stars to appear on the meridian whenever the weather permits his taking a star-altitude for his latitude. Should the observer not be sufficiently acquainted with the stars to avail himself readily of this information, he is recommended to procure Mr. Jeans's "Hand Book for the Stars," or some similar book.

But the right star may generally be detected when we know, within about half a degree or so, what altitude it ought to have when on the meridian, and this approximate altitude may be found by help of the star's declination, and the latitude by account; thus:—

1. FOR A MERIDIAN ALTITUDE ABOVE THE POLE.

In this case the star passes from the eastward towards the westward, and *ascends* to the meridian.

When the latitude by account and the declination have the same name. Add 90° to the declination, and subtract the latitude by account; or, which is the same thing, add the colatitude to the declination, the result will be the approximate altitude, measured from the S. in N. lat. and from the N. in S. lat.

When the latitude by account and the declination have different names. Add together the latitude by account, and the declination, and subtract the sum from 90° , or, which is the same thing, subtract the declination from the colatitude, the result will be the approximate altitude from the S. in N. lat. and from the N. in S. lat. If the sum of lat. and dec. exceed 90° the star cannot appear above the horizon.

2. FOR A MERIDIAN ALTITUDE BELOW THE POLE.

In this case the star passes from the westward towards the eastward and *descends* to the meridian. It can be visible

below the Pole only when the latitude and declination have the same name.

From the sum of the latitude and declination subtract 90° : the remainder will be the approximate altitude reckoned from the N. in N. lat. and from the S. in S. lat. If the sum of lat. and dec. be less than 90° the star will pass the meridian below the Pole under the horizon.

To assist in thus getting an approximate meridian altitude, the stars' declinations—each to the nearest degree and minute—are given in the marginal column of the Table. It is scarcely possible to mistake the star, because no other will have nearly the same meridian altitude at the time.

The approximate altitude being found in this way, and the index of the instrument set to it—the sight being directed to the proper point of the horizon—the true meridian altitude, and thence the latitude of the ship, may be readily determined.

It is to be observed that if the mean time at ship be A.M., we must add 12^h to that time for the corresponding time in the Table, from the preceding noon, when the star opposite that time will pass the meridian above the Pole. If the mean time at ship be P.M. the star opposite that time in the Table, will be on the meridian above the Pole; and if 12^h be added to the time, the star opposite the result, will be on the meridian below the Pole.

TABLE 10.

Best Time for taking the Altitude of a Celestial Object, with the view of determining the TIME at Sea.

When the time at the ship is to be deduced from an altitude, it is desirable that the object observed should be in such a position that a small error in the observation may

have the least possible influence on the magnitude of the hour-angle. And this position is attained when the object is on the prime vertical. If, however, the declination be of a contrary name to the latitude of the place of observation, the object will cross the prime vertical before it rises and after it sets, so that it cannot be *observed* on this circle at all; the observation should then be taken as soon after it rises (or before it sets) as that the altitude of it is sufficient to secure it from the fluctuating effects of the horizontal refraction. The altitude should not be less than 6 or 7 degrees.

The present Table points out, with accuracy enough for the purpose, the time when the prime vertical is crossed *above* the horizon, that is, when the declination is of the same name as the latitude.

If the object observed be the sun, the table is to be entered with that degree of declination which approaches nearest to the sun's declination at the time, and which is found at the top of the table; underneath this declination, and opposite to the latitude found in the first column, is the time before or after *noon* when it will be most advantageous to take the altitude for **TIME**.*

If, however, the object be a star, we must first ascertain the time when it passes over the meridian; the preceding Table will supply this information. Then, by aid of the present Table, entering it with the star's declination and the latitude of the place, we take out the corresponding time, or hour-angle between the meridian and star, when the latter is on the prime vertical. If the observation is to

* As the Table gives the hour-angle from the meridian in Time, if the object be the sun, the time will be *apparent*; the correction for Equation of Time being applied, will convert it into mean time. For a star, no such correction is requisite.

be made *before* the meridian transit, we must *subtract* the latter time from the former; if the observation is to be made *after* the meridian transit, we must *add* the two times together.

It is only when the latitude of the place is greater than the declination of the object (both being of the same name), that the object actually crosses the prime vertical; when the two are equal, the object is on the prime vertical when it is on the meridian; when the latitude is less than the declination, the Table shows the time of nearest approach to the prime vertical, which will be the best for the altitude to be observed.

We may further observe that, when the latitude of the ship is pretty nearly a mean between two consecutive latitudes in the Table, the time will be obtained more accurately by taking the mean of the times corresponding to those two latitudes.

Ex. 1. At what time will the star α Leonis or Regulus bear due East on the 6th of February, in latitude 47° N.?

Mean time of transit, Feb. 1—20 ^m (Table 9)	12 ^h 53 ^m
Time corresponding to dec. 12° N. and lat. 47°	— 5 14
Mean time of star's bearing due East	<u>7 39 P.M.</u>

2. At what time will the star α Arietis bear nearest to the West on Nov. 21, in latitude $17^{\circ} 32'$ N.?

Time corresponding to dec. 22° and lat. 17°	2 ^h 43 ^m
„ „ „ lat. 18°	2 26
	<u>2) 5 9</u>
„ „ „ lat. $17^{\circ} 30'$, + 2	35
Mean time of star's transit (Table 9)	<u>9 56</u>
„ „ bearing nearest to W.	<u>12 31 P.M.</u>
	<u>0 31 A.M.</u>
that is, at about 31 ^m past midnight.	

NOTE.—The mean time of the meridian passage of each of the planets, and also of the moon, is given in the Nautical Almanac for every day in the year. (See Table at p. 120 of the Nautical Astronomy.)

If a planet be favorable for observation, and there be any doubt as to which of the planets it is, the doubt may be removed by noticing what known star is nearest to it, referring to Table 9 for the time of the meridian passage of that star, and then finding, from the Nautical Almanac, which of the planets it is that passes the meridian nearest to that time.

TABLE 11.

For Finding the Altitude of a Celestial Object, most suitable for ascertaining the Time at Sea.

This Table is intended to show, what altitude nearly an object of given declination must have in a given latitude to be most suitable for deducing the time from that altitude; that is to say, it points out approximately the altitude which the object has when on the prime vertical, or when it makes the nearest approach to it. When the object is a star, and the time most suitable for taking its altitude is found from the last Table, the approximate altitude of it at that time, as given by the present Table, will enable the observer readily to discover it, even should he be but little familiar with the constellations.

To these Tables is added a list of the Proper Names of certain of the principal fixed stars, and to this is subjoined the names and sounds of the letters of the Greek Alphabet.

TABLE 1.

NATURAL SINES AND TANGENTS TO EVERY QUARTER
POINT OF THE COMPASS.

POINTS.	SINE.	COSINE.	TANGENT.	COTANGENT.	
0	0.00000	1.00000	0.00000	Infinite	8
$\frac{1}{4}$	.04907	.99899	.04913	20.25560	7 $\frac{1}{2}$
$\frac{1}{2}$	.09802	.99618	.09849	10.15319	7 $\frac{1}{4}$
$\frac{3}{4}$	.14730	.98918	.14834	6.74146	7 $\frac{1}{8}$
1	.19509	.98079	.19891	5.02784	7
$1\frac{1}{4}$	.24298	.97008	.25049	3.99222	6 $\frac{3}{4}$
$1\frac{1}{2}$	.29028	.95694	.30335	3.29488	6 $\frac{1}{2}$
$1\frac{3}{4}$	.33689	.94154	.35781	2.79481	6 $\frac{1}{4}$
2	.38268	.92388	.41421	2.41421	6
$2\frac{1}{4}$	.42756	.90399	.47296	2.11422	5 $\frac{3}{4}$
$2\frac{1}{2}$	.47140	.88192	.53451	1.87087	5 $\frac{1}{2}$
$2\frac{3}{4}$	.51410	.85773	.59938	1.66840	5 $\frac{1}{4}$
3	.55556	.83147	.66818	1.49661	5
$3\frac{1}{4}$	.59570	.80321	.74165	1.34884	4 $\frac{3}{4}$
$3\frac{1}{2}$	.63439	.77301	.82068	1.21850	4 $\frac{1}{2}$
$3\frac{3}{4}$	.67156	.74095	.90835	1.10838	4 $\frac{1}{4}$
4	.70711	.70711	1.00000	1.00000	4
	COSINE.	SINE.	COTANGENT.	TANGENT.	POINTS.

TABLE 2.

LOGARITHMIC SINES AND TANGENTS TO EVERY QUARTER
POINT OF THE COMPASS.

POINTS.	SINE.	COSINE.	TANGENT.	COTANGENT.	
0	0.00000	10.00000	0.00000	Infinite	8
$\frac{1}{4}$	8.99079	9.99948	8.99132	11.30898	7 $\frac{1}{2}$
$\frac{1}{2}$	8.99130	9.99790	8.99840	11.00860	7 $\frac{1}{4}$
$\frac{3}{4}$	9.16652	9.98627	9.17125	10.82875	7 $\frac{1}{8}$
1	9.29024	9.99157	9.29886	10.70134	7
$1\frac{1}{4}$	9.36557	9.98879	9.36878	10.60121	6 $\frac{3}{4}$
$1\frac{1}{2}$	9.46282	9.98068	9.46194	10.51806	6 $\frac{1}{2}$
$1\frac{3}{4}$	9.52749	9.97284	9.55365	10.44635	6 $\frac{1}{4}$
2	9.56284	9.96562	9.61722	10.38278	6
$2\frac{1}{4}$	9.63099	9.95616	9.67488	10.32517	5 $\frac{3}{4}$
$2\frac{1}{2}$	9.67839	9.94543	9.72796	10.27204	5 $\frac{1}{2}$
$2\frac{3}{4}$	9.71105	9.93326	9.77770	10.22320	5 $\frac{1}{4}$
3	9.74474	9.91965	9.82489	10.17511	5
$3\frac{1}{4}$	9.77508	9.90488	9.87020	10.12960	4 $\frac{3}{4}$
$3\frac{1}{2}$	9.80226	9.88818	9.91417	10.08563	4 $\frac{1}{2}$
$3\frac{3}{4}$	9.82708	9.86979	9.95739	10.04370	4 $\frac{1}{4}$
4	9.84949	9.84949	10.00000	10.00000	4
	COSINE.	SINE.	COTANGENT.	TANGENT.	POINTS.

1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".

TABLE 3.

NATURAL SINE.											
	0°	1°	2°	3°	4°	5°	6°	7°			
0	00 00	017 45	034 90	052 34	069 78	087 16	104 53	121 87	00		
1	00 29	74	035 19	63	070 05	45	82	122 16	59		
2	58	018 03	48	92	34	74	105 11	45	58		
3	87	32	77	053 21	63	088 03	40	74	57		
4	001 16	62	036 06	50	92	31	69	123 02	56		
5	45	91	85	79	071 21	60	97	31	55		
6	75	019 20	64	054 03	50	89	106 26	60	54		
7	002 01	49	93	37	79	089 18	55	59	53		
8	33	78	037 23	66	072 08	47	84	124 18	52		
9	62	020 07	52	95	37	76	107 13	47	51		
10		91	86	055 24	66	090 05	42	76	50		
11	003 20	65	038 10	53	95	34	71	125 04	49		
12	49	94	39	82	073 24	63	108 00	33	48		
13	78	021 23	68	056 11	53	92	29	62	47		
14	004 07	52	97	40	82	091 21	58	91	46		
15	34	81	039 26	69	074 11	50	87	126 20	45		
16	65	022 11	55	98	40	79	109 16	49	44		
17	95	40	84	057 27	69	092 08	45	78	43		
18	005 24	69	040 13	56	98	37	73	127 06	42		
19	53	98	42	85	075 27	66	110 02	35	41		
20		82	023 27	71	058 14	56	95	31	40		
21	006 11	56	041 00	44	85	093 24	80	93	39		
22	40	85	29	73	076 14	53	89	128 22	38		
23	69	024 14	59	059 02	43	82	111 18	51	37		
24	98	43	88	31	72	094 11	47	80	36		
25	007 27	72	042 17	60	077 01	40	76	129 08	35		
26	56	025 01	46	89	30	69	112 05	37	34		
27	85	30	75	080 18	59	98	34	66	33		
28	008 14	60	043 04	47	88	095 27	63	95	32		
29	44	89	33	76	078 17	56	91	130 24	31		
30		73	026 18	62	061 05	46	85	113 20	30		
31	009 02	47	91	34	75	096 14	49	81	29		
32	31	76	014 20	63	079 04	42	78	131 10	28		
33	60	027 05	49	92	33	71	114 07	39	27		
34	90	34	78	062 21	62	097 00	36	68	26		
35	010 18	63	045 07	50	91	29	65	97	25		
36	47	92	36	79	080 20	58	94	132 26	24		
37	76	028 21	65	063 08	49	87	115 23	54	23		
38	011 05	50	94	37	78	098 18	52	83	22		
39	34	79	046 23	66	081 07	45	80	133 12	21		
40		64	029 08	53	95	36	74	116 09	20		
41	93	38	82	064 24	65	099 03	38	70	19		
42	012 22	67	047 11	53	94	32	67	99	18		
43	51	94	40	82	082 23	61	96	134 27	17		
44	80	(30 25	69	065 11	52	90	117 25	56	16		
45	013 09	54	98	40	81	100 19	54	85	15		
46	38	83	048 27	69	088 10	48	93	135 14	14		
47	67	031 12	56	98	39	77	118 12	43	13		
48	96	41	85	066 27	68	101 06	40	72	12		
49	014 25	70	049 14	56	97	35	69	136 00	11		
50		54	99	43	85	084 26	64	98	29		
51	83	032 28	72	067 14	55	92	119 27	58	9		
52	015 13	57	050 01	43	84	102 21	56	87	8		
53	42	86	30	73	085 13	50	85	137 16	7		
54	71	033 16	59	068 02	42	79	120 14	44	6		
55	016 00	45	88	31	71	103 08	43	73	5		
56	29	74	051 17	60	086 00	37	71	138 02	4		
57	54	034 03	46	89	29	66	121 00	31	3		
58	87	32	76	069 18	58	95	29	60	2		
59	017 16	61	052 05	47	87	104 24	58	89	1		
60	45	90	34	76	087 16	53	87	139 17	0		
	89°	88°	87°	86°	85°	84°	83°	82°			

NATURAL COSINE.

TABLE 3.]

NATURAL TANGENT.

3

'	0°	1°	2°	3°	4°	5°	6°	7°	'
0	009 00	017 46	034 92	052 41	069 93	087 49	105 10	122 78	60
1	29	75	035 21	70	070 22	78	40	123 08	59
2	58	018 04	50	063 00	51	088 07	69	38	58
3	87	33	79	28	80	37	99	67	57
4	001 16	62	036 09	57	071 10	66	106 28	97	56
5	45	91	38	87	39	95	58	124 26	55
6	75	019 20	67	054 16	68	089 25	87	56	54
7	002 04	49	96	45	97	54	107 16	85	53
8	33	78	037 25	74	072 27	83	46	125 15	52
9	62	020 07	54	055 03	56	090 13	75	44	51
10	91	37	83	33	85	42	108 05	74	50
11	003 20	66	038 12	62	073 14	71	34	126 03	49
12	49	95	42	91	44	091 01	63	33	48
13	78	021 24	71	056 20	73	30	93	62	47
14	004 07	53	039 00	49	074 02	59	109 22	92	46
15	36	82	29	78	31	89	52	127 22	45
16	65	022 11	58	057 08	61	092 18	81	51	44
17	95	40	87	37	90	47	110 11	81	43
18	005 24	69	040 16	66	075 19	77	40	128 10	42
19	53	98	46	95	48	093 06	70	40	41
20	82	023 28	75	058 24	78	35	99	69	40
21	006 11	57	041 04	54	076 07	65	111 28	99	39
22	40	86	33	83	36	94	58	129 29	38
23	69	024 15	62	059 12	65	094 23	87	58	37
24	98	44	91	41	95	53	112 17	88	36
25	007 27	73	042 20	70	077 24	82	46	130 17	35
26	56	025 02	50	99	53	095 11	76	47	34
27	85	31	79	060 29	82	41	113 06	76	33
28	008 15	60	043 08	58	078 12	70	35	131 06	32
29	44	89	37	87	41	096 00	64	36	31
30	73	026 19	66	061 16	70	29	94	65	30
31	009 02	48	95	45	99	58	114 23	95	29
32	31	77	044 24	75	079 29	88	53	132 24	28
33	60	027 06	54	062 04	58	097 17	82	54	27
34	89	35	83	33	87	46	115 11	84	26
35	010 18	64	045 12	62	080 17	76	41	133 13	25
36	47	93	41	91	46	098 05	70	42	24
37	76	028 22	70	063 21	75	34	116 00	72	23
38	011 05	51	99	50	081 04	64	29	134 02	22
39	35	81	046 28	79	34	93	59	32	21
40	64	029 10	58	064 08	63	099 23	88	61	20
41	93	39	87	38	92	52	117 18	91	19
42	012 22	68	047 16	67	082 22	81	47	135 21	18
43	51	97	45	96	51	100 11	77	50	17
44	80	030 26	74	065 25	80	40	118 06	80	16
45	013 09	55	048 08	54	083 09	69	36	136 09	15
46	38	84	33	84	39	99	65	39	14
47	67	031 14	62	066 13	68	101 28	95	69	13
48	96	43	91	42	97	58	119 24	98	12
49	014 25	72	049 20	71	084 27	87	54	137 28	11
50	55	032 01	49	067 00	56	102 16	83	58	10
51	84	30	78	30	85	46	120 13	87	9
52	015 13	59	050 07	59	085 14	75	42	138 17	8
53	42	88	37	88	44	103 05	72	47	7
54	71	033 17	66	068 17	73	34	121 01	76	6
55	016 00	46	95	47	086 02	63	31	139 06	5
56	29	76	051 24	76	82	93	80	35	4
57	58	034 05	53	069 05	61	104 22	80	65	3
58	87	34	82	34	90	52	122 13	85	2
59	017 16	63	052 12	63	087 20	81	43	140 24	1
60	46	92	41	83	49	105 10	78	54	0
'	89°	88°	87°	86°	85°	84°	83°	82°	'

NATURAL COTANGENT.

NATURAL SINE. [TABLE 3.]									
	8°	9°	10°	11°	12°	13°	14°	15°	
0	139 17	156 43	173 65	190 81	207 91	224 95	241 92	258 82	60
1	46	72	93	191 09	208 20	225 23	242 20	259 10	59
2	75	101	122	88	48	52	49	38	58
3	140 04	30	51	67	77	80	77	68	57
4	38	58	79	95	209 05	226 08	243 05	260 54	56
5	61	87	175 08	192 24	83	87	83	260 22	55
6	90	158 16	37	52	62	65	62	50	54
7	141 19	45	65	81	90	93	90	79	53
8	48	73	94	193 09	210 19	227 22	244 18	261 07	52
9	77	159 02	176 23	38	47	50	46	37	51
10	142 05	81	51	66	76	78	74	63	50
11	34	59	80	95	211 04	228 07	245 03	262 19	49
12	63	88	177 08	194 23	32	35	31	262 19	48
13	92	160 17	37	52	61	63	59	47	47
14	143 20	46	66	81	89	92	87	75	46
15	49	74	94	195 09	212 18	229 20	246 15	263 03	45
16	78	161 03	178 23	38	46	48	44	31	44
17	144 07	82	52	68	75	77	72	59	43
18	36	60	80	95	213 03	230 05	247 00	264 15	42
19	64	89	179 09	196 23	31	33	28	17	41
20	93	162 18	37	52	60	62	56	43	40
21	145 22	47	66	80	88	90	84	71	39
22	51	75	95	197 09	214 17	231 18	248 13	265 00	38
23	80	163 04	180 23	37	45	46	41	28	37
24	146 08	33	52	66	74	75	69	56	36
25	37	61	81	94	215 02	232 03	249 07	266 12	35
26	66	90	181 09	198 23	30	31	249 25	266 12	34
27	95	164 19	38	51	59	60	54	40	33
28	147 23	47	66	80	87	88	82	68	32
29	52	76	95	199 06	216 16	233 16	250 10	267 15	31
30	81	165 05	182 24	37	44	45	38	267 24	30
31	148 10	33	52	65	72	73	66	52	29
32	38	62	81	94	217 01	234 01	251 04	268 08	28
33	67	91	183 09	200 22	29	29	251 22	268 08	27
34	96	166 20	38	51	58	58	51	36	26
35	149 25	48	67	79	86	86	79	64	25
36	54	77	95	201 06	218 14	235 14	252 07	269 12	24
37	82	167 06	184 24	36	43	42	35	269 30	23
38	150 11	34	52	65	71	71	63	48	22
39	40	63	81	93	99	99	91	76	21
40	69	92	185 09	202 22	219 28	236 27	253 20	270 04	20
41	97	168 20	38	50	56	56	48	32	19
42	151 26	49	67	79	85	84	76	60	18
43	55	78	95	203 07	220 13	237 12	254 04	271 16	17
44	84	169 06	186 24	36	41	40	32	271 16	16
45	152 12	35	52	64	70	69	60	44	15
46	41	64	81	93	98	97	88	73	14
47	70	92	187 10	204 21	221 26	238 25	255 16	272 00	13
48	99	170 21	38	50	55	53	45	28	12
49	153 27	50	67	78	83	82	73	56	11
50	56	78	95	205 07	222 12	239 10	256 01	273 12	10
51	85	171 07	188 24	35	40	38	29	273 12	9
52	154 14	36	52	63	68	66	57	40	8
53	42	64	81	92	97	95	85	68	7
54	71	93	189 10	206 20	223 25	240 23	257 13	274 24	6
55	155 00	172 22	38	49	53	51	41	274 24	5
56	29	50	67	77	82	79	70	52	4
57	57	79	95	207 06	224 10	241 08	258 08	275 08	3
58	86	173 08	190 24	34	38	36	28	275 08	2
59	156 15	36	52	63	67	64	54	36	1
60	43	65	81	91	95	92	82	64	0
	81°	80°	79°	78°	77°	76°	75°	74°	

NATURAL COSINE.

TABLE 3.]

NATURAL TANGENT.

5

	8°	9°	10°	11°	12°	13°	14°	15°	
0	140 54	158 38	176 33	194 38	212 56	230 87	249 33	267 95	60
1	84	68	63	68	86	231 17	64	268 26	59
2	141 13	98	93	98	213 16	48	95	57	58
3	43	159 28	177 23	195 29	47	79	250 28	68	57
4	73	59	53	59	77	232 09	56	269 20	56
5	142 02	88	83	88	214 08	40	87	51	55
6	32	160 17	178 13	196 19	38	71	251 18	82	54
7	62	47	43	49	69	233 01	49	270 13	53
8	91	77	73	80	99	32	80	44	52
9	143 21	161 07	179 03	197 10	215 29	63	252 11	78	51
10	51	37	33	40	60	93	42	271 07	50
11	81	67	63	70	90	234 24	73	38	49
12	144 10	96	93	198 01	216 21	55	253 04	69	48
13	40	162 26	180 23	31	61	85	33	272 01	47
14	70	56	53	61	82	235 16	66	32	46
15	145 00	86	83	91	217 12	47	97	63	45
16	29	163 16	181 13	199 21	43	78	254 28	84	44
17	59	46	43	52	73	236 08	59	273 26	43
18	88	76	73	82	218 04	39	90	57	42
19	146 18	164 06	182 03	200 12	34	70	255 31	86	41
20	48	36	33	42	64	237 00	52	274 19	40
21	78	66	63	73	96	31	83	51	39
22	147 07	95	93	201 03	219 25	62	256 14	82	38
23	37	165 25	183 23	33	56	93	45	275 13	37
24	67	55	53	64	96	238 23	76	45	36
25	96	85	84	94	220 17	54	257 07	76	35
26	148 26	166 15	184 14	202 24	47	85	38	276 07	34
27	56	45	44	54	78	239 16	69	39	33
28	86	74	74	85	221 08	46	258 00	70	32
29	149 15	167 04	185 04	203 15	39	77	31	277 01	31
30	45	34	34	45	69	240 08	62	32	30
31	75	64	64	76	222 00	39	93	64	29
32	150 05	94	94	204 06	31	69	259 24	95	28
33	34	168 24	186 24	36	61	241 00	55	278 26	27
34	64	54	54	66	92	31	86	58	26
35	94	84	84	97	223 22	62	260 17	89	25
36	151 24	169 14	187 14	205 27	53	93	48	279 21	24
37	53	44	45	57	88	242 23	79	52	23
38	83	74	75	88	224 14	54	261 10	83	22
39	152 13	170 04	188 05	206 18	44	85	41	280 15	21
40	43	33	35	48	75	243 16	72	46	20
41	72	63	65	79	225 05	47	262 08	77	19
42	153 02	93	95	207 09	36	77	35	281 09	18
43	32	171 23	189 25	39	67	244 08	66	40	17
44	62	53	55	70	97	39	97	73	16
45	91	83	86	208 00	226 28	70	263 28	282 03	15
46	154 21	172 13	190 16	30	58	245 01	59	34	14
47	51	43	46	61	89	32	90	66	13
48	81	73	76	91	227 19	62	264 21	97	12
49	155 11	173 03	191 06	209 21	50	83	52	283 29	11
50	40	33	36	52	61	246 24	83	60	10
51	70	63	66	82	228 11	55	265 15	81	9
52	156 00	93	97	210 13	42	86	46	284 23	8
53	30	174 23	192 27	43	73	247 17	77	54	7
54	60	53	57	73	229 03	48	266 08	66	6
55	89	83	87	211 04	34	78	39	285 17	5
56	157 19	175 13	193 17	34	64	248 09	70	49	4
57	49	43	47	64	95	40	267 01	80	3
58	79	73	78	95	230 26	71	33	286 13	2
59	158 09	176 03	194 08	212 26	56	249 02	64	43	1
60	38	33	38	56	67	33	95	44	0
	81°	80°	79°	78°	77°	76°	75°	74°	

NATURAL COTANGENT.

	16°	17°	18°	19°	20°	21°	22°	23°	
0	275 64	292 87	309 02	325 57	342 02	358 37	374 61	390 73	60
1	276 20	293 21	310 12	326 57	343 11	359 19	375 15	391 00	59
2	276 48	293 48	310 40	327 22	343 39	359 46	375 42	391 27	58
3	277 04	294 04	311 23	327 49	344 21	360 00	376 22	392 07	57
4	277 31	294 31	311 51	328 04	344 48	360 27	376 49	392 34	56
5	277 58	294 58	312 06	328 29	345 03	360 54	377 16	393 01	55
6	278 15	295 15	312 33	328 56	345 29	361 21	377 43	393 28	54
7		295 42	312 60	329 13	345 56	361 48	378 10	393 55	53
8		295 69	312 87	329 40	346 13	362 15	378 37	394 22	52
9		295 96	313 14	329 67	346 40	362 42	378 64	394 49	51
10	43	295 15	313 41	330 24	347 17	363 19	379 19	395 01	50
11	71	295 43	313 69	330 52	347 45	363 47	379 47	395 29	49
12	99	295 71	313 97	331 20	348 13	364 15	380 15	395 57	48
13	127	295 99	314 25	331 48	348 41	364 43	380 43	396 25	47
14	155	296 26	314 53	331 76	349 09	365 11	381 11	396 53	46
15	183	296 54	315 21	332 04	349 37	365 39	381 39	397 21	45
16	211	297 10	315 49	332 32	349 65	366 07	382 07	397 49	44
17	239	297 38	316 17	332 60	350 33	366 35	382 35	398 17	43
18	267	297 66	316 45	332 88	351 01	367 03	383 03	398 45	42
19	295	297 94	317 03	333 16	351 29	367 31	383 31	399 13	41
20	281 23	298 21	317 31	333 44	351 57	368 00	384 00	399 41	40
21	281 50	298 48	317 59	333 72	352 25	368 28	384 28	399 69	39
22	282 18	299 04	318 27	334 00	352 53	368 56	384 56	400 37	38
23	282 46	299 32	318 55	334 28	353 21	369 24	385 24	401 05	37
24	283 14	299 60	319 23	334 56	353 49	369 52	385 52	401 33	36
25	283 42	300 15	319 51	335 24	354 17	370 20	386 20	402 01	35
26	284 10	300 43	320 19	335 52	354 45	370 48	386 48	402 29	34
27	284 38	301 11	320 47	336 20	355 13	371 16	387 16	402 57	33
28	285 06	301 39	321 15	336 48	355 41	371 44	387 44	403 25	32
29	285 34	301 67	321 43	337 16	356 09	372 12	388 12	403 53	31
30	286 02	301 95	322 11	337 44	356 37	372 40	388 40	404 21	30
31	286 30	302 23	322 39	338 12	357 05	373 08	389 08	404 49	29
32	286 58	302 51	323 07	338 40	357 33	373 36	389 36	405 17	28
33	287 26	303 19	323 35	339 08	358 01	374 04	390 04	405 45	27
34	287 54	303 47	324 03	339 36	358 29	374 32	390 32	406 13	26
35	288 22	304 15	324 31	339 64	358 57	375 00	391 00	406 41	25
36	288 50	304 43	325 00	340 32	359 25	375 28	391 28	407 09	24
37	289 18	305 11	325 28	341 00	359 53	375 56	391 56	407 37	23
38	289 46	305 39	325 56	341 28	360 21	376 24	392 24	408 05	22
39	290 14	306 07	326 24	341 56	360 49	376 52	392 52	408 33	21
40	290 42	306 35	326 52	342 24	361 17	377 20	393 20	409 01	20
41	291 10	307 03	327 20	342 52	361 45	377 48	393 48	409 29	19
42	291 38	307 31	327 48	343 20	362 13	378 16	394 16	409 57	18
43	291 66	308 00	328 16	343 48	362 41	378 44	394 44	410 25	17
44	291 94	308 28	328 44	344 16	363 09	379 12	395 12	410 53	16
45	292 22	308 56	329 12	344 44	363 37	379 40	395 40	411 21	15
46	292 50	309 24	329 40	345 12	364 05	380 08	396 08	411 49	14
47	293 18	309 52	330 08	345 40	364 33	380 36	396 36	412 17	13
48	293 46	310 20	330 36	346 08	365 01	381 04	397 04	412 45	12
49	294 14	310 48	331 04	346 36	365 29	381 32	397 32	413 13	11
50	294 42	311 16	331 32	347 04	365 57	382 00	398 00	413 41	10
51	295 10	311 44	332 00	347 32	366 25	382 28	398 28	414 09	9
52	295 38	312 12	332 28	348 00	366 53	382 56	398 56	414 37	8
53	295 66	312 40	332 56	348 28	367 21	383 24	399 24	415 05	7
54	295 94	313 08	333 24	348 56	367 49	383 52	399 52	415 33	6
55	296 22	313 36	333 52	349 24	368 17	384 20	400 20	416 01	5
56	296 50	314 04	334 20	349 52	368 45	384 48	400 48	416 29	4
57	297 18	314 32	334 48	350 20	369 13	385 16	401 16	416 57	3
58	297 46	315 00	335 16	350 48	369 41	385 44	401 44	417 25	2
59	298 14	315 28	335 44	351 16	370 09	386 12	402 12	417 53	1
60	298 42	315 56	336 12	351 44	370 37	386 40	402 40	418 21	0
61	299 10	316 24	336 40	352 12	371 05	387 08	403 08	418 49	
62	299 38	316 52	337 08	352 40	371 33	387 36	403 36	419 17	
63	299 66	317 20	337 36	353 08	372 01	388 04	404 04	419 45	
64	300 34	317 48	338 04	353 36	372 29	388 32	404 32	420 13	
65	301 02	318 16	338 32	354 04	372 57	389 00	405 00	420 41	
66	301 30	318 44	339 00	354 32	373 25	389 28	405 28	421 09	
67	301 58	319 12	339 28	355 00	373 53	390 00	406 00	421 37	
68	302 26	319 40	339 56	355 28	374 21	390 28	406 28	422 05	
69	302 54	320 08	340 24	355 56	374 49	390 56	406 56	422 33	
70	303 22	320 36	340 52	356 24	375 17	391 24	407 24	423 01	
71	303 50	321 04	341 20	356 52	375 45	391 52	407 52	423 29	
72	304 18	321 32	341 48	357 20	376 13	392 20	408 20	423 57	
73	304 46	322 00	342 16	357 48	376 41	392 48	408 48	424 25	
74	305 14	322 28	342 44	358 16	377 09	393 16	409 16	424 53	
75	305 42	322 56	343 12	358 44	377 37	393 44	409 44	425 21	
76	306 10	323 24	343 40	359 12	378 05	394 12	410 12	425 49	
77	306 38	323 52	344 08	359 40	378 33	394 40	410 40	426 17	
78	307 06	324 20	344 36	360 08	379 01	395 08	411 08	426 45	
79	307 34	324 48	345 04	360 36	379 29	395 36	411 36	427 13	
80	308 02	325 16	345 32	361 04	379 57	396 04	412 04	427 41	
81	308 30	325 44	346 00	361 32	380 25	396 32	412 32	428 09	
82	308 58	326 12	346 28	362 00	380 53	397 00	413 00	428 37	
83	309 26	326 40	346 56	362 28	381 21	397 28	413 28	429 05	
84	309 54	327 08	347 24	362 56	381 49	397 56	413 56	429 33	
85	310 22	327 36	347 52	363 24	382 17	398 24	414 24	430 01	
86	310 50	328 04	348 20	363 52	382 45	398 52	414 52	430 29	
87	311 18	328 32	348 48	364 20	383 13	399 20	415 20	430 57	
88	311 46	329 00	349 16	364 48	383 41	399 48	415 48	431 25	
89	312 14	329 28	349 44	365 16	384 09	400 16	416 16	431 53	
90	312 42	329 56	350 12	365 44	384 37	400 44	416 44	432 21	
91	313 10	330 24	350 40	366 12	385 05	401 12	417 12	432 49	
92	313 38	330 52	351 08	366 40	385 33	401 40	417 40	433 17	
93	314 06	331 20	351 36	367 08	386 01	402 08	418 08	433 45	
94	314 34	331 48	352 04	367 36	386 29	402 36	418 36	434 13	
95	315 02	332 16	352 32	368 04	386 57	403 04	419 04	434 41	
96	315 30	332 44	353 00	368 32	387 25	403 32	419 32	435 09	
97	315 58	333 12	353 28	369 00	387 53	404 00	420 00	435 37	
98	316 26	333 40	353 56	369 28	388 21	404 28	420 28	436 05	
99	316 54	334 08	354 24	369 56	388 49	404 56	420 56	436 33	
100	317 22	334 36	354 52	370 24	389 17	405 24	421 24	437 01	

TABLE 3.]

NATURAL TANGENT.

7

	16°	17°	18°	19°	20°	21°	22°	23°	
0	286 74	305 73	324 92	344 83	363 97	383 86	404 03	424 47	60
1	287 06	306 05	325 24	345 65	364 80	384 20	405 36	425 82	59
2	287 38	306 37	325 56	345 98	365 13	385 53	406 70	426 16	58
3	287 69	306 69	326 28	346 30	365 46	386 25	407 04	426 51	57
4	288 01	307 00	326 21	346 63	365 79	386 58	407 38	427 19	56
5	288 32	307 32	326 53	346 96	366 12	387 31	408 07	427 54	55
6	288 64	307 64	327 25	347 28	366 45	387 64	408 40	428 22	54
7	288 95	307 95	327 57	347 61	366 78	387 97	408 73	428 55	53
8	289 27	308 27	328 29	347 93	367 11	388 30	409 06	429 28	52
9	289 58	308 58	328 62	348 26	367 44	388 63	409 39	429 61	51
10	290 21	309 21	328 94	348 59	367 77	388 96	409 72	430 28	50
11	290 53	309 53	329 27	349 22	368 10	389 29	410 05	430 61	49
12	291 16	310 16	329 59	349 55	368 43	389 62	410 38	430 94	48
13	291 47	310 47	330 32	350 28	368 76	390 25	410 71	431 27	47
14	291 79	311 19	330 64	350 61	369 09	390 58	411 04	431 60	46
15	292 10	311 51	330 97	350 94	369 42	391 21	411 37	431 93	45
16	292 42	312 23	331 29	351 27	369 75	391 54	411 70	432 26	44
17	292 74	312 55	331 62	351 60	370 08	392 27	412 03	432 59	43
18	293 06	313 27	331 94	351 93	370 41	392 60	412 36	433 22	42
19	293 38	313 59	332 27	352 26	370 74	392 93	412 69	433 55	41
20	293 70	314 31	332 59	352 59	371 07	393 26	413 02	434 28	40
21	294 02	314 64	333 32	353 22	371 40	393 59	413 35	434 61	39
22	294 34	314 96	333 64	353 55	371 73	394 22	413 68	434 94	38
23	294 66	315 28	333 97	353 88	372 06	394 55	414 01	435 27	37
24	294 98	315 61	334 29	354 21	372 39	395 28	414 34	435 60	36
25	295 30	315 93	334 62	354 54	372 72	395 61	414 67	435 93	35
26	295 62	316 26	334 94	354 87	373 05	395 94	415 00	436 26	34
27	295 94	316 58	335 27	355 20	373 38	396 27	415 33	436 59	33
28	296 26	317 31	335 59	355 53	373 71	396 60	415 66	437 22	32
29	296 58	317 63	336 32	356 26	374 04	396 93	415 99	437 55	31
30	297 30	317 96	336 64	356 59	374 37	397 26	416 32	438 28	30
31	297 62	318 28	336 97	357 22	374 70	397 59	416 65	438 61	29
32	297 94	318 61	337 29	357 55	375 03	398 22	416 98	438 94	28
33	298 26	318 93	337 62	358 28	375 36	398 55	417 31	439 27	27
34	298 58	319 26	337 94	358 61	375 69	399 28	417 64	439 60	26
35	299 30	319 58	338 27	358 94	376 02	399 61	417 97	440 23	25
36	299 62	320 31	338 59	359 27	376 35	400 24	418 30	440 56	24
37	299 94	320 63	339 32	359 60	376 68	400 57	418 63	441 29	23
38	300 26	320 96	339 64	360 23	377 01	401 20	418 96	441 62	22
39	300 58	321 28	340 37	360 56	377 34	401 53	419 29	441 95	21
40	301 30	321 61	340 69	361 29	377 67	402 26	419 62	442 28	20
41	301 62	321 93	341 32	361 62	378 00	402 59	419 95	442 61	19
42	301 94	322 26	341 64	361 95	378 33	403 22	420 28	442 94	18
43	302 26	322 58	341 97	362 28	378 66	403 55	420 61	443 27	17
44	302 58	323 31	342 29	362 61	379 29	404 28	420 94	443 60	16
45	303 30	323 63	342 62	362 94	379 62	404 61	421 27	443 93	15
46	303 62	323 96	342 94	363 27	380 25	404 94	421 60	444 26	14
47	303 94	324 28	343 37	363 60	380 58	405 27	421 93	444 59	13
48	304 26	324 61	343 69	363 93	381 21	405 60	422 26	444 92	12
49	304 58	324 93	344 32	364 26	381 54	405 93	422 59	445 25	11
50	305 30	325 26	344 64	364 59	382 27	406 26	422 92	445 58	10
51	305 62	325 58	344 97	365 22	382 60	406 59	423 25	445 91	9
52	305 94	326 31	345 29	365 55	382 93	407 22	423 58	446 24	8
53	306 26	326 63	345 62	366 28	383 26	407 55	423 91	446 57	7
54	306 58	326 96	345 94	366 61	383 59	408 28	424 24	446 90	6
55	307 30	327 28	346 37	366 94	384 22	408 61	424 57	447 23	5
56	307 62	327 61	346 69	367 27	384 55	408 94	424 90	447 56	4
57	307 94	327 93	347 32	367 60	385 28	409 27	425 23	447 89	3
58	308 26	328 26	347 64	367 93	385 61	409 60	425 56	448 22	2
59	308 58	328 58	347 97	368 26	385 94	410 23	425 89	448 55	1
60	309 30	329 31	348 29	368 59	386 27	410 56	426 22	448 88	0

NATURAL COTANGENT.

	24°	25°	26°	27°	28°	29°	30°	31°	32°
0	406 74	423 62	438 37	453 99	469 47	484 81	500 00	515 04	530 00
1	407 00	88	63	454 25	73	485 06	25	29	59
2	27	423 15	89	51	99	32	50	54	58
3	53	41	439 16	77	470 24	57	76	79	57
4	80	67	42	455 03	50	83	501 01	516 04	531 00
5	408 06	94	68	29	76	486 08	26	28	55
6	33	424 20	94	54	471 01	34	51	53	54
7	60	46	440 20	80	27	59	76	78	58
8	86	73	46	456 06	53	84	502 01	517 03	532 00
9	409 13	99	72	32	78	487 10	27	28	51
10	39	425 25	98	58	472 04	35	52	53	50
11	66	52	441 24	84	29	61	77	78	49
12	92	78	51	457 10	55	86	503 02	518 03	533 00
13	410 19	426 04	77	36	81	488 11	27	28	47
14	45	31	442 03	62	473 06	37	52	52	46
15	72	57	29	87	32	62	77	77	45
16	98	83	55	458 13	53	88	504 03	519 02	534 00
17	411 25	427 09	81	39	83	489 13	28	27	43
18	51	36	443 07	65	474 09	38	53	52	42
19	78	62	33	91	34	64	79	77	41
20	412 04	88	59	459 17	60	89	505 03	520 02	535 00
21	81	428 15	55	42	86	490 14	28	26	39
22	57	41	444 11	68	475 11	40	53	51	38
23	84	67	37	94	37	65	78	76	37
24	413 10	94	64	460 20	62	90	506 03	521 01	536 00
25	37	429 20	90	46	88	491 16	28	26	36
26	63	46	445 16	72	476 14	41	54	51	34
27	90	72	42	97	39	66	79	75	33
28	414 16	99	88	461 23	65	92	507 04	522 00	537 00
29	43	430 25	94	49	90	492 17	29	25	31
30	69	51	446 20	75	477 16	42	54	50	30
31	96	77	46	462 01	41	68	79	75	29
32	415 22	431 04	72	26	67	93	508 04	523 00	538 00
33	49	30	96	52	93	493 18	29	24	37
34	75	56	447 24	78	478 18	44	54	49	35
35	416 02	82	50	463 04	44	69	79	74	33
36	28	432 09	76	30	69	94	509 04	524 00	539 00
37	55	35	448 02	55	95	494 19	29	24	32
38	81	61	28	81	479 20	45	54	48	31
39	417 07	87	54	464 07	46	70	79	73	31
40	34	433 13	80	33	71	95	510 04	525 00	540 00
41	60	40	449 06	58	97	495 21	29	24	30
42	87	66	32	84	480 22	46	54	47	28
43	418 13	92	58	465 10	48	71	79	73	27
44	40	434 18	94	36	73	96	511 04	526 00	541 00
45	66	45	450 10	61	99	496 22	29	24	26
46	92	71	36	87	481 24	47	54	46	25
47	419 19	97	62	466 13	50	72	79	71	23
48	45	435 23	88	39	75	97	512 04	527 00	542 00
49	72	49	451 14	64	482 01	497 23	29	24	22
50	98	75	40	90	26	48	54	45	20
51	420 24	436 02	68	467 16	52	78	79	70	19
52	51	28	92	42	77	98	513 04	528 00	543 00
53	77	54	452 18	67	483 03	498 24	29	24	17
54	421 04	80	43	93	28	49	54	44	16
55	30	437 06	69	468 19	54	74	79	69	15
56	56	33	95	44	79	99	514 04	529 00	544 00
57	83	59	453 21	70	484 05	499 24	29	24	13
58	422 09	85	47	96	30	50	54	43	12
59	35	438 11	73	469 21	56	75	79	67	11
60	62	37	99	47	81	500 00	515 04	530 00	545 00
	65°	64°	63°	62°	61°	60°	59°	58°	57°

TABLE 3.]

NATURAL TANGENT.

9

	24°	25°	26°	27°	28°	29°	30°	31°	
0	445 23	468 31	487 73	508 53	531 71	554 31	577 35	600 98	60
1	58	66	74	82	89	96	103	110	61
2	93	102	110	118	125	132	139	146	62
3	446 27	469 37	488 81	510 26	533 08	555 07	578 13	601 26	63
4	62	73	83	93	103	113	123	133	64
5	97	108	118	128	138	148	158	168	65
6	447 32	470 43	489 89	511 36	534 21	556 21	579 29	602 45	66
7	67	79	89	99	109	119	129	139	67
8	448 02	469 14	488 62	510 09	533 07	555 07	578 07	601 07	68
9	37	50	62	74	86	98	110	122	69
10	72	85	97	109	121	133	145	157	70
11	449 07	470 21	489 70	511 20	534 12	556 12	579 12	602 12	71
12	42	56	69	82	95	108	121	134	72
13	77	92	105	118	131	144	157	170	73
14	450 12	471 28	490 78	512 30	535 20	557 20	580 20	603 20	74
15	47	63	78	93	107	121	135	149	75
16	82	99	115	130	145	160	174	189	76
17	451 17	472 34	491 87	513 03	536 07	558 07	581 07	604 07	77
18	52	70	88	106	124	142	160	178	78
19	87	106	125	144	163	182	201	220	79
20	452 22	473 38	492 91	514 14	537 17	559 17	582 17	605 17	80
21	57	77	96	115	134	153	172	191	81
22	92	112	132	151	170	189	208	227	82
23	453 27	474 42	493 96	515 19	538 21	560 21	583 21	606 21	83
24	62	83	104	125	146	167	188	209	84
25	97	119	141	163	185	207	229	251	85
26	454 32	475 49	494 103	516 24	539 26	561 26	584 26	607 26	86
27	67	90	113	136	159	182	205	228	87
28	455 02	476 18	495 73	517 24	540 26	562 26	585 26	608 26	88
29	38	62	86	110	134	158	182	206	89
30	73	98	123	148	173	197	221	245	90
31	456 08	477 24	496 79	518 29	541 31	563 31	586 31	609 31	91
32	43	69	95	121	147	173	199	225	92
33	73	100	127	154	181	208	234	261	93
34	457 13	478 29	497 83	519 33	542 35	564 35	587 35	610 35	94
35	48	76	104	132	160	188	216	244	95
36	84	113	142	171	200	229	258	287	96
37	458 19	479 35	498 90	520 34	543 36	565 36	588 36	611 36	97
38	54	84	114	144	174	204	234	264	98
39	89	120	151	182	213	244	274	305	99
40	459 24	480 40	499 95	521 35	544 37	566 37	589 37	612 37	100
41	60	91	122	153	184	215	246	277	
42	95	127	159	191	222	253	284	315	
43	460 30	481 46	500 100	522 36	545 38	567 38	590 38	613 38	
44	65	98	130	162	194	226	258	290	
45	461 01	482 17	501 04	523 37	546 39	568 39	591 39	614 39	
46	36	70	104	138	172	206	240	274	
47	71	106	141	176	211	246	281	316	
48	462 06	483 22	502 09	524 38	547 40	569 40	592 40	615 40	
49	42	78	113	148	183	218	253	288	
50	77	113	148	183	218	253	288	323	
51	463 12	484 28	503 15	525 39	548 41	570 41	593 41	616 41	
52	48	88	123	158	193	228	263	298	
53	83	115	150	185	220	255	290	325	
54	464 18	485 34	504 21	526 40	549 42	571 42	594 42	617 42	
55	54	93	128	163	198	233	268	303	
56	89	125	160	195	230	265	300	335	
57	465 25	486 41	505 28	527 41	550 43	572 43	595 43	618 43	
58	60	98	133	168	203	238	273	308	
59	95	128	163	198	233	268	303	338	
60	466 31	487 47	506 34	528 42	551 44	573 44	596 44	619 44	
	65°	64°	63°	62°	61°	60°	59°	58°	

NATURAL COTANGENT.

	32°	33°	34°	35°	36°	37°	38°	39°	
0	529 92	544 84	559 19	573 58	587 79	601 82	615 66	629 22	60
1	530 17	545 08	560 43	574 81	588 02	602 05	616 12	630 00	59
2	531 41	546 13	561 48	576 05	590 28	603 28	617 19	631 13	58
3	532 66	547 37	563 12	577 29	591 49	604 49	618 40	632 25	57
4	533 91	548 61	564 36	578 53	592 73	605 74	619 64	633 38	56
5	535 15	550 86	566 60	580 77	594 98	607 98	621 88	635 51	55
6	536 40	552 10	568 84	582 01	596 20	609 21	623 11	637 04	54
7	537 65	553 35	569 89	583 24	597 43	610 44	624 35	638 17	53
8	538 90	554 59	571 12	584 48	598 67	611 67	625 59	639 30	52
9	539 14	556 83	572 36	585 72	599 90	612 90	627 82	640 43	51
10	540 38	558 08	574 60	587 96	601 14	614 14	629 06	641 56	50
11	541 63	559 32	576 84	589 19	602 37	615 37	630 29	643 09	49
12	542 88	560 56	578 08	590 43	603 61	616 61	631 52	644 22	48
13	543 12	561 81	579 32	591 67	604 84	617 84	632 75	645 35	47
14	544 37	562 05	580 56	592 91	605 08	618 08	633 98	646 48	46
15	545 61	563 29	581 80	593 15	606 31	619 31	635 21	647 61	45
16	546 86	564 54	582 05	594 38	607 54	620 54	636 44	648 74	44
17	548 11	566 78	583 29	595 62	608 78	621 78	637 68	649 87	43
18	549 35	568 02	584 53	596 86	609 01	622 01	638 91	650 00	42
19	550 60	569 27	585 77	597 10	610 25	623 25	639 15	651 13	41
20	551 84	570 51	587 01	598 33	611 48	624 48	640 38	652 26	40
21	552 09	571 75	588 25	599 57	612 72	625 72	641 62	653 39	39
22	553 34	573 00	589 49	601 81	613 95	626 95	642 85	654 52	38
23	554 58	574 24	590 73	602 04	614 18	627 18	643 08	655 65	37
24	555 83	575 48	591 97	603 28	615 42	628 42	644 32	656 78	36
25	556 07	576 72	592 21	604 52	616 65	629 65	645 55	657 91	35
26	557 32	577 97	593 45	605 76	617 89	630 89	646 78	659 04	34
27	558 56	579 21	594 69	606 99	619 12	632 12	647 01	660 17	33
28	559 81	580 45	595 93	608 23	620 36	633 36	648 25	661 30	32
29	560 05	581 69	596 17	609 47	621 59	634 59	649 48	662 43	31
30	561 30	582 94	597 41	610 70	622 82	635 82	650 72	663 56	30
31	562 54	584 18	598 65	611 94	623 06	636 06	651 95	664 69	29
32	563 79	585 42	599 89	612 18	624 29	637 29	652 18	665 82	28
33	564 04	586 66	601 13	613 41	625 52	638 52	653 42	666 95	27
34	565 28	587 91	602 36	614 65	626 76	639 76	654 65	668 08	26
35	566 53	589 15	603 60	615 89	627 99	640 99	655 89	669 21	25
36	567 77	590 39	604 84	616 12	628 22	641 22	656 12	670 34	24
37	568 02	591 63	605 08	617 36	629 46	642 46	657 36	671 47	23
38	569 26	592 88	606 32	618 60	630 69	643 69	658 60	672 60	22
39	570 51	594 12	607 56	619 83	631 93	644 93	659 83	673 73	21
40	571 75	595 36	608 80	620 07	632 16	645 16	660 07	674 86	20
41	572 00	596 60	609 04	621 31	633 40	646 40	661 31	675 99	19
42	573 24	597 84	610 28	622 54	634 63	647 63	662 54	677 12	18
43	574 49	599 08	611 52	623 78	635 87	648 87	663 78	678 25	17
44	575 73	600 32	612 76	624 01	636 10	649 10	664 01	679 38	16
45	576 97	601 56	613 00	625 25	637 34	650 34	665 25	680 51	15
46	578 22	602 81	614 24	626 49	638 58	651 58	666 49	681 64	14
47	579 46	603 05	615 48	627 73	639 82	652 82	667 73	682 77	13
48	580 71	604 29	616 72	628 97	640 06	653 06	668 97	683 90	12
49	581 95	605 53	617 96	629 21	641 30	654 30	669 21	685 03	11
50	582 20	606 78	618 20	630 45	642 54	655 54	670 45	686 16	10
51	583 44	607 02	619 44	631 69	643 78	656 78	671 69	687 29	9
52	584 69	608 26	620 68	632 93	644 02	657 02	672 93	688 42	8
53	585 93	609 50	621 92	633 17	645 26	658 26	673 17	689 55	7
54	587 17	610 74	622 16	634 41	646 50	659 50	674 41	690 68	6
55	588 42	611 98	623 40	635 65	647 74	660 74	675 65	691 81	5
56	589 66	612 22	624 64	636 89	648 98	661 98	676 89	692 94	4
57	590 91	613 46	625 88	637 13	649 22	662 22	677 13	693 07	3
58	592 15	614 70	626 12	638 37	650 46	663 46	678 37	694 20	2
59	593 40	615 94	627 36	639 61	651 70	664 70	679 61	695 33	1
60	594 64	616 18	628 60	640 85	652 94	665 94	680 85	696 46	0
	57°	56°	55°	54°	53°	52°	51°	50°	

TABLE 3.]

NATURAL TANGENT.

11

	32°	33°	34°	35°	36°	37°	38°	39°	
0	624 87	649 41	674 51	700 21	726 54	753 55	781 29	809 78	80
1	625 27	650 24	675 36	701 07	727 43	754 01	782 22	810 27	81
2	626 06	651 06	676 20	702 38	728 32	755 38	783 16	811 23	82
3	627 30	652 31	677 06	703 25	729 21	756 29	784 10	812 20	83
4	628 11	653 14	678 32	704 12	730 10	757 21	785 04	813 16	84
5	629 33	654 38	679 17	705 42	731 00	758 12	786 45	814 13	85
6	630 14	655 21	680 02	706 29	732 34	759 04	787 39	815 10	86
7	631 36	656 04	681 30	707 17	733 23	760 42	788 34	816 06	87
8	632 17	657 29	682 15	708 04	734 13	761 34	789 28	817 03	88
9	633 01	658 13	683 01	709 35	735 07	762 28	790 22	818 00	89
10	634 40	659 38	684 29	710 23	736 37	763 18	791 17	819 46	90
11	635 27	660 24	685 14	711 10	737 26	764 10	792 12	820 44	91
12	636 14	661 05	686 00	712 42	738 16	765 02	793 06	821 41	92
13	637 07	662 39	687 28	713 29	739 06	766 40	794 01	822 38	93
14	638 00	663 14	688 14	714 17	740 41	767 33	795 44	823 36	94
15	639 12	664 40	689 00	715 05	741 31	768 25	796 39	824 34	95
16	640 35	665 24	690 28	716 37	742 21	769 18	797 34	825 31	96
17	641 17	666 08	691 14	717 25	743 12	770 10	798 29	826 29	97
18	642 00	667 34	692 00	718 13	744 02	771 03	799 24	827 27	98
19	643 22	668 15	693 29	719 01	745 38	772 42	800 20	828 25	99
20	644 04	669 02	694 16	720 34	746 28	773 35	801 15	829 23	100
21	645 23	670 28	695 02	721 22	747 19	774 28	802 11	830 22	
22	646 11	671 13	696 31	722 11	748 10	775 21	803 06	831 20	
23	647 34	672 39	697 18	723 44	749 00	776 15	804 02	832 18	
24	648 17	673 24	698 04	724 32	750 37	777 08	805 46	833 16	
25	649 00	674 09	699 34	725 21	751 28	778 01	806 42	834 15	
26	650 27	675 36	700 21	726 10	752 19	779 41	807 38	835 14	
27	651 14	676 20	701 07	727 01	753 09	780 35	808 40	836 13	
28	652 31	677 06	702 38	728 32	754 01	781 29	809 30	837 12	
29	653 14	678 32	703 25	729 21	755 38	782 22	810 27	838 11	
30	654 38	679 17	704 12	730 10	756 29	783 16	811 23	839 10	
31	655 21	680 02	705 42	731 00	757 21	784 10	812 20	840 09	
32	656 04	681 30	706 29	732 34	758 12	785 04	813 16	841 08	
33	657 29	682 15	707 17	733 23	759 04	786 45	814 13	842 07	
34	658 13	683 01	708 04	734 13	760 42	787 39	815 10	843 06	
35	659 38	684 29	709 35	735 07	761 34	788 34	816 06	844 05	
36	660 24	685 14	710 23	736 37	762 28	789 28	817 03	845 04	
37	661 05	686 00	711 10	737 26	763 18	790 22	818 00	846 03	
38	662 39	687 28	712 42	738 16	764 10	791 17	819 46	847 02	
39	663 14	688 14	713 29	739 06	765 02	792 12	820 44	848 01	
40	664 40	689 00	714 17	740 41	766 40	793 06	821 41	849 00	
41	665 24	690 28	715 05	741 31	767 33	794 01	822 38	850 00	
42	666 08	691 14	716 37	742 21	768 25	795 44	823 36	851 00	
43	667 34	692 00	717 25	743 12	769 18	796 39	824 34	852 00	
44	668 15	693 29	718 13	744 02	770 10	797 34	825 31	853 00	
45	669 02	694 16	719 01	745 38	771 03	798 29	826 29	854 00	
46	670 28	695 02	720 34	746 28	772 42	799 24	827 27	855 00	
47	671 13	696 31	721 22	747 19	773 35	800 20	828 25	856 00	
48	672 39	697 18	722 11	748 10	774 28	801 15	829 23	857 00	
49	673 24	698 04	723 44	749 00	775 21	802 11	830 22	858 00	
50	674 09	699 34	724 32	750 37	776 15	803 06	831 20	859 00	
51	675 36	700 21	725 21	751 28	777 08	804 02	832 18	860 00	
52	676 20	701 07	726 10	752 19	778 01	805 46	833 16	861 00	
53	677 06	702 38	727 01	753 09	779 41	806 42	834 15	862 00	
54	678 32	703 25	728 32	754 01	780 35	807 38	835 14	863 00	
55	679 17	704 12	729 21	755 38	781 29	808 40	836 13	864 00	
56	680 02	705 42	730 10	756 29	782 22	809 30	837 12	865 00	
57	681 30	706 29	731 00	757 21	783 16	810 27	838 11	866 00	
58	682 15	707 17	732 34	758 12	784 10	811 23	839 10	867 00	
59	683 01	708 04	733 23	759 04	785 04	812 20	840 09	868 00	
60	684 29	709 35	734 13	760 42	786 45	813 16	841 08	869 00	
61	685 14	710 23	735 07	761 34	787 39	814 13	842 07	870 00	
62	686 00	711 10	736 37	762 28	788 34	815 10	843 06	871 00	
63	687 28	712 42	737 26	763 18	789 28	816 06	844 05	872 00	
64	688 14	713 29	738 16	764 10	790 22	817 03	845 04	873 00	
65	689 00	714 17	739 06	765 02	791 17	818 00	846 03	874 00	
66	690 28	715 05	740 41	766 40	792 12	819 46	847 02	875 00	
67	691 14	716 37	741 31	767 33	793 06	820 44	848 01	876 00	
68	692 00	717 25	742 21	768 25	794 01	821 41	849 00	877 00	
69	693 29	718 13	743 12	769 18	795 44	822 38	850 00	878 00	
70	694 16	719 01	744 02	770 10	796 39	823 36	851 00	879 00	
71	695 02	720 34	745 38	771 03	797 34	824 34	852 00	880 00	
72	696 31	721 22	746 28	772 42	798 29	825 31	853 00	881 00	
73	697 18	722 11	747 19	773 35	799 24	826 29	854 00	882 00	
74	698 04	723 44	748 10	774 28	800 20	827 27	855 00	883 00	
75	699 34	724 32	749 00	775 21	801 15	828 25	856 00	884 00	
76	700 21	725 21	750 37	776 15	802 11	829 23	857 00	885 00	
77	701 07	726 10	751 28	777 08	803 06	830 22	858 00	886 00	
78	702 38	727 01	752 19	778 01	804 02	831 20	859 00	887 00	
79	703 25	728 32	753 09	779 41	805 46	832 18	860 00	888 00	
80	704 12	729 21	754 01	780 35	806 42	833 16	861 00	889 00	
81	705 42	730 10	755 38	781 29	807 38	834 15	862 00	890 00	
82	706 29	731 00	756 29	782 22	808 40	835 14	863 00	891 00	
83	707 17	732 34	757 21	783 16	809 30	836 13	864 00	892 00	
84	708 04	733 23	758 12	784 10	810 27	837 12	865 00	893 00	
85	709 35	734 13	759 04	785 04	811 23	838 11	866 00	894 00	
86	710 23	735 07	760 42	786 45	812 20	839 10	867 00	895 00	
87	711 10	736 37	761 34	787 39	813 16	840 09	868 00	896 00	
88	712 42	737 26	762 28	788 34	814 13	841 08	869 00	897 00	
89	713 29	738 16	763 18	789 28	815 10	842 07	870 00	898 00	
90	714 17	739 06	764 10	790 22	816 06	843 06	871 00	899 00	
91	715 05	740 41	765 02	791 17	817 03	844 05	872 00	900 00	
92	716 37	741 31	766 40	792 12	818 00	845 04	873 00	901 00	
93	717 25	742 21	767 33	793 06	819 46	846 03	874 00	902 00	
94	718 13	743 12	768 25	794 01	820 44	847 02	875 00	903 00	
95	719 01	744 02	769 18	795 44	821 41	848 01	876 00	904 00	
96	720 34	745 38	770 10	796 39	822 38	849 00	877 00	905 00	
97	721 22	746 28	771 03	797 34	823 36	850 00	878 00	906 00	
98	722 11	747 19	772 42	798 29	824 34	851 00	879 00	907 00	
99	723 44	748 10	773 35	799 24	825 31	852 00	880 00	908 00	
100	724 32	749 00	774 28	800 20	826 29	853 00	881 00	909 00	
101	725 21	750 37	775 21	801 15	827 27	854 00	882 00	910 00	
102	726 10	751 28	776 15	802 11	828 25	855 00	883 00	911 00	
103	727 01	752 19	777 08	803 06	829 23	856 00	884 00	912 00	
104	728 32	753 09	778 01	804 02	830 22	857 00	885 00	913 00	
105	729 21	754 01	779 41	805 46	831 20	858 00	886 00	914 00	
106	730 10	755 38	780 35	806 42	832 18	859 00	887 00	915 00	
107	731 00	756 29	781 29	807 38	833 16	860 00	888 00	916 00	
108	732 34	757 21	782 22	808 40	834 15	861 00	889 00	917 00	
109	733 23	758 12	783 16	809 30	835 14	862 00	890 00	918 00	
110	734 13	759 04	784 10	810 27	836 13	863 00	891 00	919 00	
111	735 07	760 42	785 04	811 23	837 12	864 00	892 00	920 00	
112	736 37	761 34	786 45	812 20	838 11	865 00	893 00	921 00	
113	737 26	762 28	787 39	813 16	839 10	866 00	894 00	922 00	
114	738 16	763 18	788 34	814 13	840 09	867 00	895 00	923 00	
115	739 06	764 10	789 28	815 10	841 08	868 00	896 00	924 00	
116	740 41	765 02	790						

	40°	41°	42°	43°	44°	45°	46°	47°	
0	642 79	656 06	669 13	682 00	694 69	707 11	719 34	731 35	60
1	643 01	28	35	21	87	31	54	55	59
2	23	50	56	42	695 08	52	74	75	58
3	46	72	78	64	29	72	95	95	57
4	68	94	99	85	49	93	720 15	732 15	56
5	90	657 16	670 21	683 06	70	708 13	35	34	55
6	644 12	38	43	27	91	34	55	54	54
7	35	59	64	49	696 12	55	75	74	53
8	57	81	86	70	33	75	95	94	52
9	79	658 03	671 07	91	54	96	721 16	733 14	51
10	645 01	25	29	684 12	75	709 16	36	33	50
11	24	47	51	34	96	37	56	53	49
12	46	69	73	55	697 17	57	76	73	48
13	68	91	94	76	37	78	96	93	47
14	90	659 13	672 15	97	58	98	722 16	734 13	46
15	646 12	35	37	695 18	79	710 19	36	32	45
16	35	56	58	39	698 00	39	57	52	44
17	57	78	80	61	21	59	77	72	43
18	79	660 00	673 01	82	42	60	97	91	42
19	647 01	22	23	686 03	62	711 00	723 17	735 11	41
20	23	44	44	24	83	21	37	31	40
21	46	66	66	45	699 04	41	57	51	39
22	68	88	87	66	25	62	77	70	38
23	90	661 10	674 09	88	46	82	97	90	37
24	648 12	31	30	687 09	66	712 03	724 17	736 10	36
25	34	53	52	30	87	23	37	29	35
26	56	75	73	51	700 08	43	57	49	34
27	78	97	95	72	29	64	77	69	33
28	649 01	662 18	675 16	93	49	84	97	88	32
29	23	40	38	688 14	70	713 05	725 17	737 08	31
30	45	62	59	35	91	25	37	28	30
31	67	84	80	57	701 12	45	57	47	29
32	89	663 05	676 02	78	32	66	77	67	28
33	650 11	27	23	99	53	86	97	87	27
34	33	49	45	689 20	74	714 07	726 17	738 06	26
35	55	71	66	41	95	27	37	26	25
36	77	93	88	62	702 15	47	57	46	24
37	651 00	664 14	677 09	83	36	68	77	65	23
38	22	36	30	690 04	57	85	97	85	22
39	44	58	52	25	77	715 08	727 17	739 04	21
40	66	80	73	46	98	29	37	24	20
41	88	665 01	95	67	703 19	49	57	44	19
42	652 10	23	678 16	88	39	69	77	63	18
43	32	45	37	691 09	60	90	97	83	17
44	54	66	59	30	81	716 10	728 17	740 02	16
45	76	88	80	51	704 01	30	37	22	15
46	98	666 10	679 01	72	22	50	57	41	14
47	653 20	32	23	93	43	71	77	61	13
48	42	53	44	692 14	63	91	97	80	12
49	64	75	65	35	84	717 11	729 17	741 00	11
50	86	97	87	56	705 05	32	37	20	10
51	654 08	667 18	680 08	77	25	52	57	39	9
52	30	40	29	98	46	72	76	59	8
53	52	62	51	693 19	67	92	96	78	7
54	74	83	72	40	87	718 13	730 16	742 17	6
55	96	668 05	93	61	706 08	33	36	22	5
56	655 18	27	681 15	82	28	53	56	37	4
57	40	48	36	694 08	49	73	76	56	3
58	62	70	57	24	70	94	96	76	2
59	84	91	79	45	90	719 14	731 16	743 14	1
60	656 06	669 13	682 00	66	707 11	34	36	24	0
	49°	48°	47°	46°	45°	44°	43°	42°	

TABLE 3.]

NATURAL TANGENT.

13

	40°	41°	42°	43°	44°	45°	46°	47°	
0	839 10	869 29	900 40	932 52	965 69	1 00 000	1 08 558	1 07 287	80
1	60	80	93	933 06	966 25	068	613	299	59
2	840 09	870 31	901 46	934 15	967 83	81	674	362	58
3	59	82	99	934 15	967 83	175	734	425	57
4	841 08	871 33	902 51	935 24	968 50	94	794	487	56
5	58	84	903 04	935 24	968 50	291	855	550	55
6	842 08	872 36	904 10	936 33	969 07	86	915	613	54
7	58	87	904 10	936 33	969 07	408	976	676	53
8	843 07	873 38	905 16	937 42	970 20	467	1 04 038	738	52
9	57	89	906 16	937 42	970 20	525	097	801	51
10	844 07	874 41	906 21	938 52	971 33	583	158	864	50
11	57	92	906 21	938 52	971 33	642	218	927	49
12	845 07	875 43	907 27	939 06	972 46	701	279	990	48
13	57	95	907 27	939 06	972 46	759	340	1 06 063	47
14	846 06	876 46	908 34	940 16	973 02	818	401	116	46
15	56	98	908 34	940 16	973 02	878	461	179	45
16	847 06	877 49	909 40	941 25	974 16	935	522	243	44
17	56	878 01	909 40	941 25	974 16	994	583	306	43
18	848 06	879 04	910 46	942 35	975 29	1 01 053	644	369	42
19	56	879 04	910 46	942 35	975 29	112	705	432	41
20	849 06	880 07	911 53	943 45	976 43	170	766	496	40
21	56	880 07	911 53	943 45	976 43	229	827	559	39
22	850 06	881 10	912 06	944 00	977 00	288	888	622	38
23	57	881 10	912 06	944 00	977 00	347	949	686	37
24	851 07	882 13	913 13	945 10	978 13	406	1 06 010	749	36
25	57	882 13	913 13	945 10	978 13	465	072	813	35
26	852 07	883 17	914 19	946 20	979 27	524	133	876	34
27	57	883 17	914 19	946 20	979 27	583	194	940	33
28	853 07	884 21	915 26	947 31	980 41	642	255	1 09 003	32
29	58	884 21	915 26	947 31	980 41	702	317	067	31
30	854 08	885 24	916 33	948 41	981 55	761	378	131	30
31	58	885 24	916 33	948 41	981 55	820	439	195	29
32	855 09	886 28	917 40	949 52	982 13	879	501	258	28
33	59	886 28	917 40	949 52	982 13	938	562	322	27
34	856 10	887 32	918 47	950 02	983 27	998	624	386	26
35	60	887 32	918 47	950 02	983 27	1 09 057	685	450	25
36	857 10	888 36	919 01	951 13	984 41	117	747	514	24
37	61	888 36	919 01	951 13	984 41	176	809	578	23
38	858 11	889 40	920 08	952 24	985 56	236	870	642	22
39	62	889 40	920 08	952 24	985 56	295	932	706	21
40	859 12	890 45	921 16	953 35	986 70	355	994	770	20
41	63	890 45	921 16	953 35	986 70	414	1 06 056	834	19
42	860 14	891 49	922 24	954 46	987 84	474	117	899	18
43	64	891 49	922 24	954 46	987 84	533	179	963	17
44	861 15	892 01	923 31	955 57	988 99	593	241	1 10 027	16
45	65	892 01	923 31	955 57	988 99	653	303	091	15
46	862 16	893 06	924 39	956 68	989 31	713	365	156	14
47	67	893 06	924 39	956 68	989 31	772	427	220	13
48	863 18	894 10	925 47	957 79	990 44	832	489	285	12
49	68	894 10	925 47	957 79	990 44	892	551	349	11
50	864 19	895 15	926 55	958 90	991 58	952	613	414	10
51	70	895 15	926 55	958 90	991 58	1 08 012	676	478	9
52	865 21	896 20	927 03	959 01	992 73	072	738	543	8
53	72	896 20	927 03	959 01	992 73	132	800	608	7
54	866 23	897 25	928 11	960 12	993 87	192	862	672	6
55	74	897 25	928 11	960 12	993 87	252	925	737	5
56	867 25	898 30	929 19	961 23	994 20	312	987	802	4
57	76	898 30	929 19	961 23	994 20	372	1 07 049	867	3
58	868 27	899 35	930 27	962 34	995 34	433	112	931	2
59	78	899 35	930 27	962 34	995 34	493	174	996	1
60	869 29	900 40	931 35	963 45	1 00 000	553	237	1 11 061	0
	49°	48°	47°	46°	45°	44°	43°	42°	

NATURAL COTANGENT.

	48°	49°	50°	51°	52°	53°	54°	55°	
0	743 14	754 71	766 04	777 15	788 01	798 64	809 02	819 15	60
1	34	90	23	33	19	81	19	32	59
2	53	755 09	42	51	37	99	36	49	58
3	73	28	61	69	55	799 16	53	65	57
4	92	47	79	88	73	34	70	82	56
5	744 12	66	98	779 06	91	51	87	99	55
6	31	85	767 17	24	789 08	68	810 04	820 15	54
7	51	756 04	35	43	26	86	21	32	53
8	70	23	54	61	44	800 03	38	48	52
9	89	42	72	79	62	21	55	65	51
10	745 09	61	91	97	80	38	72	82	50
11	28	81	768 10	779 16	98	56	89	98	49
12	48	757 00	23	34	790 16	73	811 06	821 15	48
13	67	19	47	52	33	91	23	32	47
14	86	38	66	70	51	801 08	40	48	46
15	746 06	57	84	88	69	25	57	65	45
16	25	75	769 08	780 07	87	43	74	81	44
17	44	94	21	25	791 05	60	91	98	43
18	64	758 13	40	43	22	78	812 08	822 14	42
19	83	32	59	61	40	95	25	31	41
20	747 08	51	77	79	58	802 12	42	48	40
21	22	70	96	98	76	30	59	64	39
22	41	89	770 14	781 16	93	47	76	81	38
23	60	759 08	33	34	792 11	64	93	97	37
24	80	27	51	52	29	82	813 10	823 14	36
25	99	46	70	70	47	99	27	30	35
26	748 18	65	88	88	64	803 16	44	47	34
27	38	84	771 07	782 06	82	34	61	63	33
28	57	760 03	25	25	793 00	51	78	80	32
29	76	22	44	43	18	68	95	96	31
30	96	41	62	61	35	86	814 12	824 13	30
31	749 15	59	81	79	53	804 08	28	29	29
32	34	78	99	97	71	20	45	46	28
33	53	97	772 18	783 15	88	38	62	62	27
34	73	761 16	36	33	794 06	55	79	78	26
35	92	35	55	51	24	72	96	95	25
36	750 11	54	73	69	41	89	815 13	825 11	24
37	30	73	92	87	59	805 07	30	28	23
38	50	92	773 10	784 05	77	24	46	44	22
39	69	762 10	29	24	94	41	63	61	21
40	88	29	47	42	795 12	58	80	77	20
41	751 17	48	66	60	30	76	97	93	19
42	26	67	84	78	47	93	816 14	826 10	18
43	46	86	774 02	96	65	806 10	31	26	17
44	65	763 04	21	785 14	83	27	47	43	16
45	81	23	39	32	796 00	44	64	59	15
46	752 03	42	58	50	18	62	81	75	14
47	22	61	76	68	35	79	98	92	13
48	41	80	94	86	53	96	817 14	827 08	12
49	61	98	775 13	786 04	71	807 13	31	24	11
50	80	764 17	31	22	88	30	48	41	10
51	99	36	50	40	797 06	48	65	57	9
52	753 18	55	68	58	23	65	82	73	8
53	37	73	86	76	41	82	98	90	7
54	56	92	776 05	94	58	99	818 15	828 06	6
55	75	765 11	23	787 11	76	808 16	32	22	5
56	95	30	41	29	93	33	48	39	4
57	754 14	48	60	47	798 11	50	65	55	3
58	33	67	78	65	29	67	82	71	2
59	52	86	96	83	46	85	99	87	1
60	71	766 04	777 15	788 01	64	809 02	819 15	829 04	0
	41°	40°	39°	38°	37°	36°	35°	34°	

TABLE 3.

NATURAL TANGENT.

15

	48°	49°	50°	51°	52°	53°	54°	55°	
0	1.11 061	1.15 037	1.19 175	1.23 490	1.27 994	1.32 704	1.37 698	1.42 815	60
1	126	104	246	563	1.28 071	785	722	908	59
2	191	172	316	637	148	865	807	992	58
3	256	240	387	710	225	946	891	1.43 080	57
4	321	308	457	784	302	1.38 026	976	169	56
5	387	375	525	858	379	107	1.38 060	258	55
6	452	443	589	931	456	188	145	347	54
7	517	511	669	1.24 005	533	268	229	436	53
8	582	579	740	079	610	349	314	525	52
9	648	647	811	153	687	430	399	614	51
10	713	715	882	227	764	511	484	708	50
11	778	783	953	301	842	592	568	792	49
12	844	851	1.20 024	375	919	673	653	881	48
13	909	919	095	449	997	754	738	970	47
14	975	987	166	523	1.29 074	835	824	1.44 060	46
15	1.12 041	1.16 056	237	597	152	916	909	149	45
16	106	124	308	672	229	998	994	239	44
17	172	192	379	746	307	1.34 079	1.39 079	329	43
18	238	261	451	820	385	160	165	418	42
19	303	329	522	895	463	242	250	508	41
20	369	398	593	969	541	323	336	598	40
21	435	466	665	1.25 044	619	405	421	688	39
22	501	535	736	118	696	487	507	778	38
23	567	603	808	193	775	568	593	868	37
24	633	672	879	268	853	650	679	958	36
25	699	741	951	343	931	732	764	1.45 049	35
26	765	809	1.21 023	417	1.30 009	814	850	139	34
27	831	878	094	492	087	896	936	229	33
28	897	947	166	567	166	978	1.40 022	320	32
29	963	1.17 016	238	642	244	1.35 060	109	410	31
30	1.13 029	085	310	717	323	142	195	501	30
31	096	154	382	792	401	224	281	582	29
32	162	223	454	867	480	307	367	662	28
33	228	292	526	943	558	389	454	773	27
34	295	361	598	1.26 018	637	472	540	864	26
35	361	430	670	093	716	554	627	955	25
36	428	500	742	169	795	637	714	1.46 046	24
37	494	569	814	244	873	719	800	137	23
38	561	638	887	320	952	802	887	229	22
39	627	708	959	395	1.31 031	885	974	320	21
40	694	777	1.22 031	471	110	968	1.41 061	411	20
41	761	846	104	545	190	1.36 051	148	508	19
42	828	916	176	622	269	184	235	595	18
43	894	986	249	698	348	217	322	686	17
44	961	1.18 055	321	774	427	300	409	778	16
45	1.14 028	125	394	849	507	383	497	870	15
46	095	194	467	925	588	466	584	962	14
47	162	264	539	1.27 001	666	549	672	1.47 054	13
48	229	334	612	077	745	633	759	146	12
49	296	404	685	153	825	716	847	238	11
50	363	474	758	230	904	800	934	330	10
51	430	544	831	306	984	883	1.42 022	422	9
52	498	614	904	382	1.32 064	967	110	514	8
53	565	684	977	458	144	1.37 050	198	607	7
54	632	754	1.23 050	535	224	134	286	699	6
55	699	824	123	611	304	218	374	792	5
56	767	894	196	688	384	302	462	885	4
57	834	964	270	764	464	386	550	977	3
58	902	1.19 035	343	841	544	470	638	1.48 070	2
59	969	105	416	917	624	554	728	168	1
60	1.15 037	175	490	994	704	638	815	256	0
41°		40°	39°	38°	37°	36°	35°	34°	

NATURAL COTANGENT.

16	NATURAL SINE.								[TABLE 3.]	
	56°	57°	58°	59°	60°	61°	62°	63°		
0	829 04	838 67	848 05	857 17	866 08	874 62	882 95	891 01	60	
1	20	83	20	82	17	72	883 08	14	59	
2	36	99	36	47	32	90	22	27	58	
3	53	859 15	51	62	46	875 04	36	40	57	
4	69	80	66	77	61	15	49	53	56	
5	85	46	82	92	75	32	63	67	55	
6	830 01	62	97	858 06	90	46	77	80	54	
7	17	78	849 13	21	867 04	61	90	93	53	
8	34	94	28	36	19	75	984 04	892 06	52	
9	50	840 09	43	51	33	89	17	19	51	
10	66	25	59	66	48	876 08	31	32	50	
11	82	41	74	81	62	17	45	45	49	
12	98	57	89	96	77	31	58	59	48	
13	831 15	72	850 05	859 11	91	45	72	72	47	
14	31	88	20	26	808 05	59	85	85	46	
15	47	841 04	35	41	20	73	99	98	45	
16	63	20	51	56	34	87	885 12	893 11	44	
17	79	35	66	70	49	877 01	26	24	43	
18	95	51	81	85	63	15	39	37	42	
19	832 12	67	96	860 00	78	29	53	50	41	
20	28	82	851 12	15	92	43	66	63	40	
21	44	98	27	30	869 06	56	80	76	39	
22	60	842 14	42	45	21	70	93	89	38	
23	76	30	57	59	35	84	886 07	894 02	37	
24	92	45	73	74	49	98	20	15	36	
25	833 08	61	88	89	64	878 12	34	28	35	
26	24	77	852 08	861 04	78	26	47	41	34	
27	40	92	18	19	93	40	61	54	33	
28	56	843 08	34	33	870 07	54	74	67	32	
29	73	24	49	48	21	68	88	80	31	
30	89	39	64	63	36	82	887 01	895 03	30	
31	834 05	55	79	78	50	96	15	895 06	29	
32	21	70	94	92	64	879 09	28	19	28	
33	37	86	853 10	862 07	79	23	41	32	27	
34	53	844 02	25	22	93	37	55	45	26	
35	69	17	40	37	871 07	51	68	58	25	
36	85	33	55	51	21	65	82	71	24	
37	835 01	48	70	66	36	79	95	84	23	
38	17	64	85	81	50	93	888 08	897 02	22	
39	33	80	854 01	95	64	880 06	22	896 10	21	
40	49	95	16	863 10	78	20	35	23	20	
41	65	845 11	31	25	93	34	48	36	19	
42	81	26	46	40	872 07	48	62	49	18	
43	97	42	61	54	21	62	75	62	17	
44	836 13	57	76	69	35	75	88	74	16	
45	29	73	91	84	50	89	889 02	87	15	
46	45	88	855 06	98	64	881 08	15	897 00	14	
47	61	846 04	21	864 13	78	17	28	13	13	
48	76	19	36	27	92	30	42	26	12	
49	92	35	51	42	873 06	44	55	29	11	
50	837 08	50	67	57	21	58	68	52	10	
51	24	66	82	71	35	72	81	64	9	
52	40	81	97	86	49	85	95	77	8	
53	56	97	856 12	865 01	63	99	890 08	90	7	
54	72	847 12	27	15	77	882 13	21	898 03	6	
55	88	28	42	30	91	26	35	16	5	
56	838 04	43	57	44	874 06	40	48	28	4	
57	20	59	72	59	20	54	61	41	3	
58	35	74	87	73	34	67	74	54	2	
59	51	89	857 02	88	48	81	87	67	1	
60	67	848 05	17	866 13	62	95	891 01	79	0	
	33°	32°	31°	30°	29°	28°	27°	26°		

NATURAL COSINE.

TABLE 3.]

NATURAL TANGENT.

17

	56°	57°	58°	59°	60°	61°	62°	63°	
0	1.48 256	1.53 987	1.60 033	1.66 428	1.73 205	1.80 405	1.88 073	1.96 261	60
1	349	1.54 085	137	538	321	529	205	402	59
2	442	183	241	647	438	653	337	544	58
3	536	281	345	757	555	777	469	685	57
4	629	379	449	867	671	901	602	827	56
5	722	478	553	978	788	1.81 025	734	969	55
6	816	576	657	1.07 088	905	150	887	1.97 111	54
7	909	675	761	1.18	1.74 022	274	1.89 000	253	53
8	1.49 003	774	865	309	140	399	133	395	52
9	097	873	970	419	257	524	266	538	51
10	190	972	1.61 074	530	375	649	400	681	50
11	284	1.55 071	179	641	492	774	533	823	49
12	378	170	283	752	610	899	607	966	48
13	472	269	385	863	728	1.82 025	501	1.98 110	47
14	566	368	493	974	846	150	935	253	46
15	661	467	598	1.08 085	964	276	1.90 089	396	45
16	755	567	703	1.18	1.75 082	402	203	540	44
17	849	666	809	308	200	528	337	684	43
18	944	766	914	419	319	654	472	828	42
19	1.50 038	866	1.62 019	531	437	780	607	972	41
20	133	963	125	643	556	906	741	1.99 116	40
21	228	1.56 065	230	754	675	1.83 033	876	261	39
22	322	165	336	866	794	159	1.91 012	406	38
23	417	265	442	979	913	298	147	550	37
24	512	366	548	1.09 091	1.76 032	413	282	695	36
25	607	466	654	2.3	151	540	418	841	35
26	7.2	566	760	316	271	667	554	966	34
27	797	667	866	428	390	794	690	2.00 131	33
28	893	767	972	541	510	922	826	277	32
29	988	868	1.63 079	653	630	1.84 049	962	423	31
30	1.51 084	969	185	766	749	177	1.92 098	569	30
31	179	1.57 069	292	879	869	305	235	715	29
32	275	170	398	992	990	4.3	371	862	28
33	370	271	506	1.70 106	1.77 110	561	508	2.01 008	27
34	466	372	612	219	230	689	645	155	26
35	562	474	719	332	351	818	782	302	25
36	658	575	826	446	471	946	920	449	24
37	754	676	984	560	592	1.85 075	1.93 057	596	23
38	850	778	1.64 041	673	713	2.4	195	743	22
39	946	879	148	787	834	333	332	891	21
40	1.52 043	981	256	901	955	462	470	2.02 039	20
41	139	1.58 063	363	1.71 015	1.78 077	591	608	187	19
42	235	184	471	139	198	720	746	335	18
43	332	283	579	244	319	850	885	483	17
44	429	388	687	358	441	979	1.94 023	631	16
45	525	490	795	473	563	1.86 1.0	1.92	790	15
46	6.2	593	903	588	685	239	301	929	14
47	719	695	1.65 011	702	807	869	400	2.03 078	13
48	816	797	120	817	929	499	579	227	12
49	913	900	228	932	1.79 051	630	718	376	11
50	1.53 010	1.59 0.2	337	1.72 047	174	780	858	526	10
51	107	106	445	163	206	891	897	675	9
52	205	208	554	278	419	1.87 021	1.96 197	826	8
53	302	311	663	393	542	152	277	975	7
54	400	414	772	509	685	283	417	2.04 125	6
55	497	517	881	625	788	415	557	276	5
56	595	620	990	741	911	546	698	426	4
57	693	723	1.66 099	857	1.80 034	677	838	577	3
58	791	826	209	973	153	809	979	728	2
59	888	930	318	1.73 089	281	911	1.88 120	879	1
60	987	1.60 033	428	2.6	406	1.88 073	261	2.05 090	0
	33°	32°	31°	30°	29°	28°	27°	26°	

NATURAL COTANGENT.

	64°	65°	66°	67°	68°	69°	70°	71°	
0	898 79	906 31	913 55	920 50	927 18	933 58	939 69	945 52	60
1	92	43	66	62	29	65	79	61	59
2	899 05	55	78	73	40	79	89	71	58
3	18	68	90	85	51	89	99	80	57
4	30	80	914 02	96	62	934 00	940 09	90	56
5	43	92	14	921 07	73	10	19	99	55
6	56	907 04	25	19	84	20	29	946 09	54
7	68	17	37	30	94	31	39	18	53
8	81	29	49	41	928 05	41	49	27	52
9	94	41	61	52	16	52	58	37	51
10	900 07	53	72	64	27	62	68	46	50
11	19	66	84	75	38	72	78	56	49
12	32	78	96	86	49	83	88	65	48
13	45	90	915 08	98	59	93	98	74	47
14	57	908 02	19	922 09	70	935 03	941 08	84	46
15	70	14	31	20	81	14	18	93	45
16	82	26	43	31	92	24	27	947 02	44
17	95	39	55	43	929 03	34	37	12	43
18	901 08	51	66	54	13	44	47	21	42
19	20	63	78	65	24	55	57	30	41
20	33	75	90	76	35	65	67	40	40
21	46	87	916 01	87	45	75	76	49	39
22	58	99	13	99	56	85	86	58	38
23	71	909 12	25	923 10	67	96	96	68	37
24	83	24	36	21	78	936 06	942 06	77	36
25	96	36	48	32	88	16	16	86	35
26	902 08	48	60	43	99	26	26	95	34
27	21	60	71	55	930 10	37	35	948 05	33
28	33	72	83	66	20	47	45	14	32
29	46	84	94	77	31	57	54	23	31
30	59	96	917 06	86	42	67	64	32	30
31	71	910 18	18	99	52	77	74	42	29
32	84	20	29	924 10	63	88	84	51	28
33	96	32	41	21	74	98	93	60	27
34	903 09	44	52	32	84	937 08	943 08	69	26
35	21	56	64	44	95	18	13	78	25
36	34	68	75	55	931 06	28	22	88	24
37	46	80	87	66	16	38	32	97	23
38	58	92	99	77	27	48	42	949 06	22
39	71	911 04	918 10	88	37	59	51	15	21
40	88	16	22	99	48	69	61	24	20
41	96	28	33	925 10	59	79	70	33	19
42	904 08	40	45	21	69	89	80	43	18
43	21	52	56	32	80	99	90	52	17
44	33	64	68	43	90	938 09	99	61	16
45	46	76	79	54	932 01	19	19	70	15
46	58	88	91	65	11	29	18	79	14
47	70	912 00	919 02	76	22	39	28	88	13
48	83	12	14	87	32	49	38	97	12
49	95	24	25	98	43	59	47	950 06	11
50	905 07	36	36	926 09	58	69	57	15	10
51	20	48	48	20	64	79	66	24	9
52	32	60	59	31	74	89	76	33	8
53	45	72	71	42	85	99	85	43	7
54	57	83	82	53	95	939 09	95	52	6
55	69	95	94	64	933 06	19	945 04	61	5
56	82	913 07	920 05	75	16	29	14	70	4
57	94	19	16	86	27	39	23	79	3
58	906 06	31	28	97	37	49	33	88	2
59	18	43	39	927 07	48	59	42	97	1
60	31	55	50	18	58	69	52	951 06	0
	25°	24°	23°	22°	21°	20°	19°	18°	

TABLE 3.]

NATURAL TANGENT.

19

	64°	65°	66°	67°	68°	69°	70°	71°	
0	2.05 090	2.14 451	2.24 604	2.35 585	2.47 509	2.60 509	2.74 748	2.90 421	60
1	182	614	789	776	716	736	797	866	59
2	333	777	956	967	924	963	2.75 246	971	58
3	485	940	2.25 132	2.36 158	2.48 132	2.61 190	4.46	2.91 246	57
4	637	2.15 104	3.9	349	340	418	746	523	56
5	790	263	486	541	549	646	998	799	55
6	942	432	663	733	758	874	2.76 217	2.92 076	54
7	2.06 094	596	840	925	967	2.62 103	495	354	53
8	247	760	2.26 018	2.37 119	2.49 177	332	750	632	52
9	400	925	196	311	386	561	2.77 002	910	51
10	553	2.16 090	374	504	597	791	254	2.93 189	50
11	706	255	552	697	807	2.63 021	507	468	49
12	860	420	730	891	2.50 018	252	761	748	48
13	2.07 014	585	909	2.38 084	229	453	2.78 014	2.94 028	47
14	167	751	2.27 088	279	440	714	269	3.9	46
15	321	917	267	473	652	945	523	591	45
16	476	2.17 083	447	668	864	2.64 177	778	872	44
17	630	249	626	863	2.51 076	410	2.79 031	2.95 155	43
18	785	416	806	2.39 058	289	642	289	487	42
19	939	582	987	253	502	875	545	7.21	41
20	2.08 094	749	2.28 167	419	715	2.65 109	802	2.96 004	40
21	250	916	348	645	929	342	2.80 059	288	39
22	405	2.18 094	528	841	2.52 142	576	316	573	38
23	560	251	710	2.40 038	357	811	574	858	37
24	716	419	891	235	571	2.66 046	833	2.97 144	36
25	872	587	2.29 073	432	786	281	2.81 091	490	35
26	2.09 028	755	254	629	2.53 001	516	350	717	34
27	184	923	437	827	217	752	610	2.98 004	33
28	341	2.19 092	619	2.41 025	432	989	870	292	32
29	499	261	801	223	648	2.67 225	2.62 130	580	31
30	654	430	984	421	865	462	391	889	30
31	811	599	2.30 167	620	2.54 082	700	653	2.99 153	29
32	969	769	351	819	299	937	914	447	28
33	2.10 126	938	534	2.42 019	516	2.68 175	2.83 176	738	27
34	284	2.20 108	718	218	734	414	439	3.00 028	26
35	442	278	902	418	952	653	702	319	25
36	600	449	2.31 083	618	2.55 170	892	965	611	24
37	758	619	271	819	389	2.69 131	2.84 229	903	23
38	916	790	456	2.43 019	603	871	494	3.01 196	22
39	2.11 075	961	641	220	827	758	758	489	21
40	233	2.21 132	826	422	2.56 046	853	2.85 023	783	20
41	392	304	2.32 012	623	266	2.70 094	289	3.02 077	19
42	552	475	197	825	487	335	555	372	18
43	711	647	388	2.44 027	707	577	622	867	17
44	871	819	570	230	928	819	2.86 089	965	16
45	2.12 030	992	756	433	2.57 150	2.71 082	866	3.08 260	15
46	190	2.22 164	943	636	371	305	624	556	14
47	350	337	2.33 130	839	593	548	892	854	13
48	511	510	317	2.45 043	815	792	2.87 161	3.04 152	12
49	671	683	505	246	2.58 038	2.72 036	430	450	11
50	832	857	693	451	261	281	700	749	10
51	993	2.23 030	881	655	484	528	970	3.05 049	9
52	2.13 154	204	2.34 069	860	708	771	2.88 240	849	8
53	316	378	258	2.46 065	932	2.73 017	511	649	7
54	477	553	447	270	2.59 156	263	783	950	6
55	639	727	636	476	381	609	2.89 055	3.06 252	5
56	801	902	825	682	606	756	327	544	4
57	963	2.24 077	2.35 015	888	831	2.74 004	600	857	3
58	2.14 125	252	205	2.47 085	2.60 057	251	873	3.07 185	2
59	288	428	395	802	283	499	2.90 147	484	1
60	451	604	585	509	509	748	421	768	0
	25°	24°	23°	22°	21°	20°	19°	18°	

NATURAL COTANGENT.

20	NATURAL SINE.										TABLE	71
	72°	73°	74°	75°	76°	77°	78°	79°				
0	961 06	966 30	961 36	965 98	970 30	974 37	978 15	981 68				
1	15	39	34	966 00	37	44	31	982 08				
2	24	47	42	08	44	50	37	983 00				
3	33	56	50	15	51	57	43	984 00				
4	42	64	58	23	58	63	50	985 00				
5	51	73	66	30	65	70	45	986 00				
6	59	81	74	38	72	76	51	987 00				
7	68	90	82	45	79	83	57	988 00				
8	77	98	90	53	86	89	63	989 00				
9	86	967 07	98	60	93	96	69	990 00				
10	95	15	962 06	67	971 00	975 02	75	991 00				
11	963 04	24	14	75	06	08	81	992 00				
12	13	32	22	82	13	15	87	993 00				
13	22	40	30	90	20	21	93	994 00				
14	31	49	38	97	27	28	99	995 00				
15	40	57	46	967 05	34	34	979 05	996 00				
16	48	66	53	12	41	41	10	997 00				
17	57	74	61	19	48	47	16	998 00				
18	66	82	69	27	55	53	22	999 00				
19	75	91	77	34	62	60	28					
20	84	99	86	42	69	68	34	72				
21	93	968 07	93	49	76	73	40	77				
22	963 01	16	963 01	56	82	79	46	83				
23	10	24	08	64	89	85	52	88				
24	19	32	16	71	96	92	58	94				
25	28	41	24	78	973 03	98	63	99				
26	37	49	32	86	10	976 04	69	963 04				
27	45	57	40	93	17	11	75	10				
28	54	65	47	968 00	23	17	81	15				
29	63	74	55	07	30	23	87	20				
30	72	82	63	15	37	30	92	25				
31	80	90	71	22	44	36	98	31				
32	89	98	79	29	51	42	960 04	36				
33	96	959 07	86	37	57	48	10	41				
34	954 07	15	94	44	64	55	16	47				
35	15	23	964 02	51	71	61	21	52				
36	24	31	10	58	78	67	27	57				
37	33	40	17	66	84	73	33	62				
38	41	48	25	73	91	80	39	68				
39	50	56	33	80	98	86	44	73				
40	59	64	40	87	973 04	92	50	78				
41	67	72	48	94	11	98	56	83				
42	76	81	56	969 02	18	977 05	61	88				
43	85	89	63	09	25	11	67	93				
44	93	97	71	16	31	17	73	94				
45	955 02	960 05	79	23	38	23	79	99				
46	11	13	86	30	45	29	84	964 04				
47	19	21	94	37	51	35	90	09				
48	28	29	965 02	45	58	42	96	14				
49	36	37	09	52	65	48	991 01	20				
50	45	46	17	59	71	54	07	30				
51	54	54	24	66	78	61	12	35				
52	62	62	32	73	84	66	18	40				
53	71	70	40	80	91	72	24	45				
54	79	78	47	87	98	78	29	50				
55	88	86	55	94	974 04	84	35	55				
56	96	94	62	970 01	11	91	40	61				
57	956 05	961 02	70	08	17	97	44	66				
58	18	10	78	15	24	978 03	52	71				
59	22	18	85	23	30	09	57	76				
60	30	26	93	30	37	15	63	81				
	17°	16°	15°	14°	13°	12°	11°	10°				

NATURAL COSINE.

TABLE 3.]

NATURAL TANGENT.

21

	72°	73°	74°	75°	76°	77°	78°	79°	80°
0	3.07 768	3.27 085	3.48 741	3.73 205	4.01 078	4.33 148	4.70 463	5.14 455	5.60
1	3.08 073	3.28 109	3.49 125	3.74 075	4.02 074	4.34 300	4.71 137	5.15 256	5.59
2	3.09 298	3.29 139	3.50 279	3.75 388	4.03 076	4.35 459	4.72 490	5.16 058	5.68
3	3.10 223	3.30 174	3.51 053	3.76 268	4.04 081	4.36 040	4.73 170	5.17 671	5.65
4	3.11 153	3.31 216	3.52 001	3.77 152	4.05 092	4.37 207	4.74 534	5.18 480	5.65
5	3.12 087	3.32 159	3.53 001	3.78 040	4.06 107	4.38 281	4.75 219	5.19 293	5.64
6	3.13 027	3.33 174	3.54 179	3.79 378	4.07 127	4.39 569	4.76 595	5.20 107	5.63
7	3.14 288	3.34 023	3.55 384	3.80 276	4.08 152	4.40 152	4.77 286	5.21 744	5.62
8	3.15 240	3.35 087	3.56 159	3.81 177	4.09 182	4.41 340	4.78 673	5.22 566	5.61
9	3.16 197	3.36 158	3.57 357	3.82 083	4.10 216	4.42 534	4.79 370	5.23 391	5.60
10	3.17 159	3.37 234	3.58 160	3.83 449	4.11 256	4.43 134	4.80 068	5.24 218	5.59
11	3.18 127	3.38 317	3.59 370	3.84 364	4.12 301	4.44 338	4.81 013	5.25 048	5.58
12	3.19 100	3.39 042	3.60 181	3.85 284	4.13 350	4.45 548	4.82 018	5.25 880	5.57
13	3.20 079	3.40 136	3.61 405	3.86 208	4.14 405	4.46 155	4.83 590	5.26 715	5.56
14	3.21 063	3.41 236	3.62 224	3.87 136	4.15 465	4.47 374	4.84 300	5.27 553	5.55
15	3.22 053	3.42 343	3.63 048	3.88 068	4.16 530	4.48 600	4.85 013	5.28 393	5.54
16	3.23 048	3.43 084	3.64 289	3.89 004	4.17 604	4.49 826	4.86 018	5.29 235	5.53
17	3.24 049	3.44 202	3.65 121	3.90 417	4.18 683	4.51 071	4.87 013	5.30 078	5.52
18	3.25 055	3.45 327	3.66 376	3.91 364	4.19 766	4.52 316	4.88 013	5.30 923	5.51
19	3.26 067	3.46 080	3.67 636	3.92 316	4.20 852	4.53 568	4.89 013	5.31 768	5.50
20	3.27 085	3.46 850	3.68 901	3.93 271	4.21 941	4.54 826	4.90 013	5.32 613	5.49
21	3.28 109	3.47 636	3.69 177	3.94 232	4.23 030	4.56 091	4.91 013	5.33 458	5.48
22	3.29 139	3.48 436	3.70 188	3.95 196	4.24 122	4.57 363	4.92 013	5.34 303	5.47
23	3.30 174	3.49 249	3.71 046	3.96 165	4.25 216	4.58 641	4.93 013	5.35 148	5.46
24	3.31 216	3.50 076	3.72 338	3.97 139	4.26 322	4.59 923	4.94 013	5.35 993	5.45
25	3.32 265	3.50 916	3.73 271	3.98 117	4.27 431	4.61 219	4.95 013	5.36 838	5.44
26	3.33 319	3.51 769	3.74 066	3.99 099	4.28 541	4.62 519	4.96 013	5.37 683	5.43
27	3.34 378	3.52 636	3.74 916	4.00 086	4.29 652	4.63 826	4.97 013	5.38 528	5.42
28	3.35 441	3.53 516	3.75 771	4.01 078	4.30 766	4.65 139	4.98 013	5.39 373	5.41
29	3.36 508	3.54 409	3.76 636	4.02 074	4.31 883	4.66 458	4.99 013	5.40 218	5.40
30	3.37 580	3.55 326	3.77 516	4.03 076	4.33 001	4.67 786	5.00 013	5.41 063	5.39
31	3.38 657	3.56 256	3.78 409	4.04 081	4.34 122	4.69 121	5.01 013	5.41 908	5.38
32	3.39 739	3.57 199	3.79 316	4.05 092	4.35 246	4.70 463	5.02 013	5.42 753	5.37
33	3.40 826	3.58 156	3.80 232	4.06 107	4.36 374	4.71 813	5.03 013	5.43 598	5.36
34	3.41 919	3.59 126	3.81 165	4.07 127	4.37 508	4.73 170	5.04 013	5.44 443	5.35
35	3.43 019	3.60 109	3.82 117	4.08 152	4.38 648	4.74 534	5.05 013	5.45 288	5.34
36	3.44 126	3.61 104	3.83 083	4.09 182	4.39 793	4.75 906	5.06 013	5.46 133	5.33
37	3.45 239	3.62 111	3.84 061	4.10 216	4.40 943	4.77 281	5.07 013	5.46 978	5.32
38	3.46 358	3.63 129	3.85 050	4.11 256	4.42 189	4.78 673	5.08 013	5.47 823	5.31
39	3.47 483	3.64 158	3.86 050	4.12 301	4.43 441	4.79 370	5.09 013	5.48 668	5.30
40	3.48 614	3.65 198	3.87 061	4.13 350	4.44 699	4.80 068	5.10 013	5.49 513	5.29
41	3.49 751	3.66 249	3.88 083	4.14 405	4.45 963	4.81 013	5.11 013	5.50 358	5.28
42	3.50 894	3.67 311	3.89 117	4.15 465	4.47 233	4.82 013	5.12 013	5.51 203	5.27
43	3.52 043	3.68 384	3.90 165	4.16 530	4.48 508	4.83 590	5.13 013	5.52 048	5.26
44	3.53 198	3.69 468	3.91 224	4.17 604	4.49 788	4.84 300	5.14 013	5.52 893	5.25
45	3.54 359	3.70 563	3.92 294	4.18 683	4.51 071	4.85 013	5.15 013	5.53 738	5.24
46	3.55 526	3.71 669	3.93 376	4.19 766	4.52 363	4.86 013	5.16 013	5.54 583	5.23
47	3.56 699	3.72 786	3.94 471	4.20 852	4.53 663	4.87 013	5.17 013	5.55 428	5.22
48	3.57 878	3.73 916	3.95 576	4.21 941	4.54 968	4.88 013	5.18 013	5.56 273	5.21
49	3.59 063	3.75 066	3.96 691	4.23 030	4.56 278	4.89 013	5.19 013	5.57 118	5.20
50	3.60 254	3.76 231	3.97 826	4.24 122	4.57 593	4.90 013	5.20 013	5.57 963	5.19
51	3.61 451	3.77 411	3.98 971	4.25 216	4.58 913	4.91 013	5.21 013	5.58 808	5.18
52	3.62 654	3.78 604	3.99 126	4.26 322	4.60 238	4.92 013	5.22 013	5.59 653	5.17
53	3.63 863	3.79 811	4.00 291	4.27 431	4.61 568	4.93 013	5.23 013	5.60 498	5.16
54	3.65 078	3.81 036	4.01 466	4.28 541	4.62 903	4.94 013	5.24 013	5.61 343	5.15
55	3.66 300	3.82 268	4.02 661	4.29 652	4.64 243	4.95 013	5.25 013	5.62 188	5.14
56	3.67 528	3.83 516	4.03 791	4.30 766	4.65 588	4.96 013	5.26 013	5.63 033	5.13
57	3.68 763	3.84 776	4.04 931	4.31 883	4.66 938	4.97 013	5.27 013	5.63 878	5.12
58	3.69 004	3.86 046	4.06 081	4.33 001	4.68 293	4.98 013	5.28 013	5.64 723	5.11
59	3.70 251	3.87 326	4.07 241	4.34 122	4.69 653	4.99 013	5.29 013	5.65 568	5.10
60	3.71 504	3.88 616	4.08 401	4.35 246	4.71 018	5.00 013	5.30 013	5.66 413	5.09
61	3.72 763	3.89 916	4.09 591	4.36 374	4.72 388	5.01 013	5.31 013	5.67 258	5.08
62	3.74 028	3.91 236	4.10 791	4.37 508	4.73 763	5.02 013	5.32 013	5.68 103	5.07
63	3.75 299	3.92 571	4.11 991	4.38 648	4.75 103	5.03 013	5.33 013	5.68 948	5.06
64	3.76 576	3.93 921	4.13 191	4.39 793	4.76 453	5.04 013	5.34 013	5.69 793	5.05
65	3.77 859	3.95 276	4.14 391	4.40 943	4.77 808	5.05 013	5.35 013	5.70 638	5.04
66	3.79 148	3.96 646	4.15 591	4.42 189	4.79 168	5.06 013	5.36 013	5.71 483	5.03
67	3.80 443	3.98 026	4.16 791	4.43 441	4.80 533	5.07 013	5.37 013	5.72 328	5.02
68	3.81 744	3.99 426	4.18 001	4.44 699	4.81 903	5.08 013	5.38 013	5.73 173	5.01
69	3.83 051	4.00 841	4.19 211	4.45 963	4.83 278	5.09 013	5.39 013	5.74 018	5.00
70	3.84 364	4.02 266	4.20 421	4.47 233	4.84 658	5.10 013	5.40 013	5.74 863	4.99
71	3.85 683	4.03 701	4.21 631	4.48 508	4.86 043	5.11 013	5.41 013	5.75 708	4.98
72	3.87 008	4.05 146	4.22 841	4.49 788	4.87 428	5.12 013	5.42 013	5.76 553	4.97
73	3.88 339	4.06 596	4.24 051	4.51 071	4.88 813	5.13 013	5.43 013	5.77 398	4.96
74	3.89 676	4.08 056	4.25 261	4.52 363	4.90 198	5.14 013	5.44 013	5.78 243	4.95
75	3.91 019	4.09 526	4.26 471	4.53 663	4.91 583	5.15 013	5.45 013	5.79 088	4.94
76	3.92 368	4.11 006	4.27 681	4.54 968	4.92 968	5.16 013	5.46 013	5.79 933	4.93
77	3.93 723	4.12 496	4.28 891	4.56 278	4.94 353	5.17 013	5.47 013	5.80 778	4.92
78	3.95 084	4.14 001	4.30 101	4.57 593	4.95 738	5.18 013	5.48 013	5.81 623	4.91
79	3.96 451	4.15 516	4.31 311	4.58 913	4.97 123	5.19 013	5.49 013	5.82 468	4.90
80	3.97 826	4.17 041	4.32 521	4.60 238	4.98 508	5.20 013	5.50 013	5.83 313	4.89
81	3.99 209	4.18 576	4.33 731	4.61 568	4.99 893	5.21 013	5.51 013	5.84 158	4.88
82	4.00 598	4.20 126	4.34 941	4.62 903	5.01 278	5.22 013	5.52 013	5.85 003	4.87
83	4.02 003	4.21 686	4.36 151	4.64 243	5.02 663	5.23 013	5.53 013	5.85 848	4.86
84	4.03 414	4.23 241	4.37 361	4.65 588	5.04 048	5.24 013	5.54 013	5.86 693	4.85
85	4.04 831	4.24 796	4.38 571	4.66 938	5.05 433	5.25 013	5.55 013	5.87 538	4.84
86	4.06 254	4.26 356	4.39 781	4.68 293	5.06 818	5.26 013	5.56 013	5.88 383	4.83
87	4.07 683	4.27 921	4.41 001	4.69 658	5.08 203	5.27 013	5.57 013	5.89 228	4.82
88	4.09 118	4.29 491	4.42 211	4.71 018	5.09 588	5.28 013	5.58 013	5.90 073	4.81
89	4.10 559	4.31 066	4.43 421	4.72 428	5.10 973	5.29 013	5.59 013	5.90 918	4.80
90	4.12 006	4.32 636	4.44 631	4.73 843	5.12 358	5.30 013	5.60 013	5.91 763	4.79
91	4.13 459	4.34 211	4.45 841	4.75 263	5.13 743	5.31 013	5.61 013	5.92 608	4.78
92	4.14 918	4.35 791	4.47 051	4.76 688	5.15 128	5.32 013	5.62 013	5.93 453	4.77
93	4.16 383	4.37 376	4.48 261	4.78 108	5.16 513	5.33 013	5.63 013	5.94 298	4.76
94	4.17 854	4.38 966	4.49 471	4.79 533	5.17 898	5.34 013	5.64 013	5.95 143	4.75
95	4.19 331	4.40 561	4.50 681	4.80 953	5.19 283	5.35 013	5.65 013	5.95 988	4.74
96	4.20 814	4.42 161	4.51 891	4.82 373	5.20 668	5.36 013	5.66 013	5.96 833	4.73
97	4.22 303	4.43 766	4.53 101	4.83					

	80°	81°	82°	83°	84°	85°	86°	87°	
0°	9848 1	9876 9	9902 7	9925 5	9945 2	9961 9	9975 6	9986 3	99
1	9849 6	9877 3	9903 1	9926 8	9946 5	9962 2	9976 8	9987 4	00
2	9849 1	9878 8	9904 5	9927 9	9947 1	9963 7	9977 0	9988 6	01
3	9850 6	9879 2	9905 9	9928 4	9948 6	9964 2	9978 5	9989 1	02
4	9851 1	9880 7	9906 4	9929 0	9949 1	9965 7	9979 0	9990 6	03
5	9852 6	9881 2	9907 9	9930 5	9950 6	9966 2	9980 5	9991 1	04
6	9853 1	9882 7	9908 4	9931 0	9951 1	9967 7	9981 0	9992 6	05
7	9854 6	9883 2	9909 9	9932 5	9952 6	9968 2	9982 5	9993 1	06
8	9855 1	9884 7	9910 4	9933 0	9953 1	9969 7	9983 0	9994 6	07
9	9856 6	9885 2	9911 9	9934 5	9954 6	9970 2	9984 5	9995 1	08
10	9857 1	9886 7	9912 4	9935 0	9955 1	9971 7	9985 0	9996 6	09
11	9858 6	9887 2	9913 9	9936 5	9956 6	9972 2	9986 5	9997 1	10
12	9859 1	9888 7	9914 4	9937 0	9957 1	9973 7	9987 0	9998 6	11
13	9860 6	9889 2	9915 9	9938 5	9958 6	9974 2	9988 5	9999 1	12
14	9861 1	9890 7	9916 4	9939 0	9959 1	9975 7	9989 0	1000 6	13
15	9862 6	9891 2	9917 9	9940 5	9960 6	9976 2	9990 5	1001 1	14
16	9863 1	9892 7	9918 4	9941 0	9961 1	9977 7	9991 0	1002 6	15
17	9864 6	9893 2	9919 9	9942 5	9962 6	9978 2	9992 5	1003 1	16
18	9865 1	9894 7	9920 4	9943 0	9963 1	9979 7	9993 0	1004 6	17
19	9866 6	9895 2	9921 9	9944 5	9964 6	9980 2	9994 5	1005 1	18
20	9867 1	9896 7	9922 4	9945 0	9965 1	9981 7	9995 0	1006 6	19
21	9868 6	9897 2	9923 9	9946 5	9966 6	9982 2	9996 5	1007 1	20
22	9869 1	9898 7	9924 4	9947 0	9967 1	9983 7	9997 0	1008 6	21
23	9870 6	9899 2	9925 9	9948 5	9968 6	9984 2	9998 5	1009 1	22
24	9871 1	9900 7	9926 4	9949 0	9969 1	9985 7	9999 0	1010 6	23
25	9872 6	9901 2	9927 9	9950 5	9970 6	9986 2	1000 5	1011 1	24
26	9873 1	9902 7	9928 4	9951 0	9971 1	9987 7	1001 0	1012 6	25
27	9874 6	9903 2	9929 9	9952 5	9972 6	9988 2	1002 5	1013 1	26
28	9875 1	9904 7	9930 4	9953 0	9973 1	9989 7	1003 0	1014 6	27
29	9876 6	9905 2	9931 9	9954 5	9974 6	9990 2	1004 5	1015 1	28
30	9877 1	9906 7	9932 4	9955 0	9975 1	9991 7	1005 0	1016 6	29
31	9878 6	9907 2	9933 9	9956 5	9976 6	9992 2	1006 5	1017 1	30
32	9879 1	9908 7	9934 4	9957 0	9977 1	9993 7	1007 0	1018 6	31
33	9880 6	9909 2	9935 9	9958 5	9978 6	9994 2	1008 5	1019 1	32
34	9881 1	9910 7	9936 4	9959 0	9979 1	9995 7	1009 0	1020 6	33
35	9882 6	9911 2	9937 9	9960 5	9980 6	9996 2	1010 5	1021 1	34
36	9883 1	9912 7	9938 4	9961 0	9981 1	9997 7	1011 0	1022 6	35
37	9884 6	9913 2	9939 9	9962 5	9982 6	9998 2	1012 5	1023 1	36
38	9885 1	9914 7	9940 4	9963 0	9983 1	9999 7	1013 0	1024 6	37
39	9886 6	9915 2	9941 9	9964 5	9984 6	1000 2	1014 5	1025 1	38
40	9887 1	9916 7	9942 4	9965 0	9985 1	1001 7	1015 0	1026 6	39
41	9888 6	9917 2	9943 9	9966 5	9986 6	1002 2	1016 5	1027 1	40
42	9889 1	9918 7	9944 4	9967 0	9987 1	1003 7	1017 0	1028 6	41
43	9890 6	9919 2	9945 9	9968 5	9988 6	1004 2	1018 5	1029 1	42
44	9891 1	9920 7	9946 4	9969 0	9989 1	1005 7	1019 0	1030 6	43
45	9892 6	9921 2	9947 9	9970 5	9990 6	1006 2	1020 5	1031 1	44
46	9893 1	9922 7	9948 4	9971 0	9991 1	1007 7	1021 0	1032 6	45
47	9894 6	9923 2	9949 9	9972 5	9992 6	1008 2	1022 5	1033 1	46
48	9895 1	9924 7	9950 4	9973 0	9993 1	1009 7	1023 0	1034 6	47
49	9896 6	9925 2	9951 9	9974 5	9994 6	1010 2	1024 5	1035 1	48
50	9897 1	9926 7	9952 4	9975 0	9995 1	1011 7	1025 0	1036 6	49
51	9898 6	9927 2	9953 9	9976 5	9996 6	1012 2	1026 5	1037 1	50
52	9899 1	9928 7	9954 4	9977 0	9997 1	1013 7	1027 0	1038 6	51
53	9900 6	9929 2	9955 9	9978 5	9998 6	1014 2	1028 5	1039 1	52
54	9901 1	9930 7	9956 4	9979 0	9999 1	1015 7	1029 0	1040 6	53
55	9902 6	9931 2	9957 9	9980 5	1000 6	1016 2	1030 5	1041 1	54
56	9903 1	9932 7	9958 4	9981 0	1001 1	1017 7	1031 0	1042 6	55
57	9904 6	9933 2	9959 9	9982 5	1002 6	1018 2	1032 5	1043 1	56
58	9905 1	9934 7	9960 4	9983 0	1003 1	1019 7	1033 0	1044 6	57
59	9906 6	9935 2	9961 9	9984 5	1004 6	1020 2	1034 5	1045 1	58
60	9907 1	9936 7	9962 4	9985 0	1005 1	1021 7	1035 0	1046 6	59
9°		8°	7°	6°	5°	4°	3°	2°	

TABLE 3.]

NATURAL TANGENT.

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	80°	81°	82°	83°	84°	85°	86°	87°	
0	5.6 7128	6.3 1375	7.1 1587	8.1 4435	9.5 1436	11. 4301	14. 3007	19. 0811	80
1	8094	2566	3042	6398	4108	4686	3807	1879	59
2	9064	3761	4553	8370	6791	5072	4212	2959	58
3	5.7 0037	4961	6071	8.2 0852	9490	5461	4823	4051	57
4	1013	6165	7594	2344	9.6 2205	5853	5436	5156	56
5	1992	7374	9125	4345	4935	6248	6069	6273	55
6	2974	8587	7.2 0661	6355	7880	6645	6885	7403	54
7	3960	9804	2204	8376	9.7 0441	7045	7817	8546	53
8	4949	6.4 1026	3754	8.3 0406	3217	7448	7964	9702	52
9	5941	2253	5310	2446	6009	7853	8596	20. 0872	51
10	6937	3484	6873	4496	8817	8262	9244	2056	50
11	7936	4720	8442	6555	9.8 1641	8673	9898	3253	49
12	8938	5961	7.3 0018	8625	4482	9067	15. 0557	4465	48
13	9944	7206	1600	8.4 0705	7338	9504	12.22	5691	47
14	5.8 0953	8456	3190	2795	9.9 0211	9923	1893	6932	46
15	1966	9710	4786	4896	3101	12. 0346	2571	8188	45
16	2982	6.5 0970	6389	7007	6007	0772	3254	9460	44
17	4001	2234	7989	9128	8931	1201	3943	21. 0747	43
18	5024	35.03	9616	8.5 1259	10. 0187	1632	4638	2049	42
19	6051	4777	7.4 1240	3402	0433	2067	5340	3369	41
20	7080	6055	2871	5555	0780	2505	6048	4704	40
21	8114	7339	4509	7718	1080	2946	6762	6056	39
22	9151	8627	6154	9893	1381	3390	7483	7426	38
23	5.9 0191	9921	7806	8.6 2078	1683	3838	8211	8813	37
24	1236	6.6 1219	9465	4275	1988	4288	5845	22. 0217	36
25	2283	2523	7.5 1132	6482	2284	4742	6687	1640	35
26	3335	3881	2806	8701	2602	5199	16. 0435	3081	34
27	4390	5144	4487	8.7 0931	2913	5660	1190	4541	33
28	5448	6463	6176	3172	3224	6124	1952	6020	32
29	6510	7787	7872	5425	3538	6691	2722	7519	31
30	7576	9116	9575	7689	3854	7062	3499	9038	30
31	8646	6.7 0450	7.6 1287	9694	4172	7536	4283	28. 0677	29
32	9720	1789	3005	8.8 2252	4491	8014	5075	2137	28
33	6.0 0797	8133	4732	4551	4813	8496	5874	3718	27
34	1378	4433	6466	6862	5136	8981	6881	5321	26
35	2962	5638	8208	9185	5462	9469	7496	6945	25
36	4051	7199	9957	8.9 1520	5789	9962	8319	8693	24
37	5143	8564	7.7 1715	3867	6118	13. 0458	9150	24. 0263	23
38	6240	9936	3490	6227	6450	0958	9990	1967	22
39	7340	6.8 1312	5254	8598	6783	1461	17. 0837	3675	21
40	8444	2694	7035	9.0 0983	7119	1989	1693	5418	20
41	9552	4082	8825	3379	7457	2490	2558	7186	19
42	6.1 0664	5475	7.8 0622	5789	7797	2996	3432	8978	18
43	1779	6874	2428	8211	8139	3515	4314	25. 0798	17
44	2899	8278	4242	9.1 0646	8463	4039	5205	2644	16
45	4023	9688	6064	3093	8929	4563	6106	4517	15
46	5151	6.9 1104	7895	5554	9178	5098	7015	6418	14
47	6283	2525	9734	8028	9529	5634	7994	8348	13
48	7419	3962	7.9 1582	9.2 0516	9882	6174	8863	26. 0807	12
49	8559	5365	3438	3016	11. 0237	6719	9802	2296	11
50	9703	6823	5302	5530	0594	7267	18. 0750	4316	10
51	6.2 0851	8264	7176	6058	0951	7821	1708	6367	9
52	2003	9718	9058	9.3 0599	1316	8378	2677	8450	8
53	3160	7.0 1174	8.0 0948	3155	1681	8940	3655	27. 0566	7
54	4321	2637	2848	5724	2048	9507	4845	2715	6
55	5486	4105	4756	8307	2417	14. 0079	5845	4899	5
56	6655	5579	6674	9.4 09.4	2789	0855	6668	7117	4
57	7829	7059	8600	2515	3163	1235	7678	9372	3
58	9007	8543	8.1 0538	6141	3540	1821	8711	28. 1864	2
59	6.3 0189	7.1 0038	2481	8781	8919	2411	9755	3954	1
60	1375	1537	4435	9.5 1498	4301	3007	19. 0811	6363	0
	9°	8°	7°	6°	5°	4°	3°	2°	1°

NATURAL COTANGENT.

$^{\circ}$	88°	89°	$^{\circ}$	$^{\circ}$	88°	89°	$^{\circ}$
0	9993 9	9998 5	60	0	28° 6363	57° 2900	60
1	9394 0	5 59	59	1	8771	58° 2612	59
2	1	6 58	58	2	29° 1220	59° 2659	58
3	2	6 57	57	3	3711	60° 3058	57
4	3	7 56	56	4	6245	61° 3829	56
5	4	7 55	55	5	8823	62° 4992	55
6	5	8 54	54	6	30° 1446	63° 6567	54
7	6	8 53	53	7	4116	64° 8580	53
8	7	9 52	52	8	6833	65° 1055	52
9	8	9 51	51	9	9599	67° 4019	51
10	9	9 50	50	10	31° 2416	68° 7501	50
11	9995 0	9999 0	49	11	5284	70° 1533	49
12	1	0 48	48	12	8205	71° 6151	48
13	2	1 47	47	13	32° 1181	73° 1390	47
14	2	1 46	46	14	4213	74° 7292	46
15	3	1 45	45	15	7303	76° 3900	45
16	4	2 44	44	16	33° 0452	78° 1263	44
17	5	2 43	43	17	3662	79° 9434	43
18	6	3 42	42	18	6935	81° 8470	42
19	7	3 41	41	19	34° 0273	83° 8435	41
20	8	3 40	40	20	3675	85° 9398	40
21	9	4 39	39	21	7151	88° 1436	39
22	9996 0	4 38	38	22	35° 0695	90° 4633	38
23	0	4 37	37	23	4313	92° 9085	37
24	1	5 36	36	24	5906	95° 4895	36
25	2	5 35	35	25	36° 1776	98° 2179	35
26	3	5 34	34	26	5627	101° 1069	34
27	3	5 33	33	27	9560	104° 1709	33
28	4	6 32	32	28	37° 3579	107° 4265	32
29	5	6 31	31	29	7686	110° 8921	31
30	6	6 30	30	30	38° 1885	114° 5887	30
31	6	6 29	29	31	6177	118° 5402	29
32	7	7 28	28	32	39° 0568	122° 7740	28
33	8	6 27	27	33	5059	127° 3213	27
34	9	7 26	26	34	9655	132° 2185	26
35	9	7 25	25	35	40° 4358	137° 5075	25
36	9997 0	8 24	24	36	9174	143° 2371	24
37	1	8 23	23	37	41° 4106	149° 4650	23
38	2	8 22	22	38	9158	156° 2591	22
39	2	8 21	21	39	42° 4335	163° 7002	21
40	3	8 20	20	40	9641	171° 8854	20
41	4	8 19	19	41	43° 5081	180° 9322	19
42	4	9 18	18	42	44° 0661	190° 9842	18
43	5	9 17	17	43	6386	202° 2188	17
44	6	9 16	16	44	45° 2261	214° 8576	16
45	6	9 15	15	45	8294	229° 1817	15
46	7	9 14	14	46	46° 4489	245° 5520	14
47	7	9 13	13	47	47° 0853	264° 4408	13
48	8	9 12	12	48	7395	286° 4777	12
49	9	9 11	11	49	48° 4121	312° 5214	11
50	9	1° 0000 0	10	50	49° 1089	343° 7737	10
51	9998 0	0 9	9	51	8157	381° 9710	9
52	0	0 8	8	52	50° 5485	429° 7176	8
53	1	0 7	7	53	51° 3042	491° 1060	7
54	2	0 6	6	54	52° 0807	572° 9572	6
55	2	0 5	5	55	8821	687° 5499	5
56	3	0 4	4	56	51° 7086	859° 4363	4
57	3	0 3	3	57	54° 5613	1145° 9158	3
58	4	0 2	2	58	55° 4415	1718° 8732	2
59	4	0 1	1	59	56° 3506	3437° 7467	1
60	5	0 0	0	60	57° 2900	Infinite.	0
1°		0°		1°		0°	

NATURAL COSINE.

NATURAL COTANGENT.

TABLE 4.

TABLE 4. DIFFERENCE OF LATITUDE AND DEPARTURE FOR $\frac{1}{2}$ POINT.														25
Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	
1	01-0	00-0	61	60-9	03-0	121	120-9	05-9	181	180-8	08-9	241	240-7	
2	02-0	00-1	62	61-9	03-0	122	121-9	06-0	182	181-8	08-9	242	241-7	
3	03-0	00-1	63	62-9	03-1	123	122-9	06-0	183	182-8	09-0	243	242-7	
4	04-0	00-2	64	63-9	03-1	124	123-9	06-1	184	183-8	09-0	244	243-7	
5	05-0	00-2	65	64-9	03-2	125	124-9	06-1	185	184-8	09-1	245	244-7	
6	06-0	00-3	66	65-9	03-2	126	125-8	06-2	186	185-8	09-1	246	245-7	
7	07-0	00-3	67	66-9	03-3	127	126-8	06-2	187	186-8	09-2	247	246-7	
8	08-0	00-4	68	67-9	03-3	128	127-8	06-3	188	187-8	09-2	248	247-7	
9	09-0	00-4	69	68-9	03-4	129	128-8	06-3	189	188-8	09-3	249	248-7	
10	10-0	00-5	70	69-9	03-4	130	129-8	06-4	190	189-8	09-3	250	249-7	
11	11-0	00-5	71	70-9	03-5	131	130-8	06-4	191	190-8	09-4	251	250-7	
12	12-0	00-6	72	71-9	03-5	132	131-8	06-5	192	191-8	09-4	252	251-7	
13	13-0	00-6	73	72-9	03-6	133	132-8	06-5	193	192-8	09-5	253	252-7	
14	14-0	00-7	74	73-9	03-6	134	133-8	06-6	194	193-8	09-5	254	253-7	
15	15-0	00-7	75	74-9	03-7	135	134-8	06-6	195	194-8	09-6	255	254-7	
16	16-0	00-8	76	75-9	03-7	136	135-8	06-7	196	195-8	09-6	256	255-7	
17	17-0	00-8	77	76-9	03-8	137	136-8	06-7	197	196-8	09-7	257	256-7	
18	18-0	00-9	78	77-9	03-8	138	137-8	06-8	198	197-8	09-7	258	257-7	
19	19-0	00-9	79	78-9	03-9	139	138-8	06-8	199	198-8	09-8	259	258-7	
20	20-0	01-0	80	79-9	03-9	140	139-8	06-9	200	199-8	09-8	260	259-7	
21	21-0	01-0	81	80-9	04-0	141	140-8	06-9	201	200-8	09-9	261	260-7	
22	22-0	01-1	82	81-9	04-0	142	141-8	07-0	202	201-8	09-9	262	261-7	
23	23-0	01-1	83	82-9	04-1	143	142-8	07-0	203	202-8	10-0	263	262-7	
24	24-0	01-2	84	83-9	04-1	144	143-8	07-1	204	203-8	10-0	264	263-7	
25	25-0	01-2	85	84-9	04-2	145	144-8	07-1	205	204-8	10-1	265	264-7	
26	26-0	01-3	86	85-9	04-2	146	145-8	07-2	206	205-8	10-1	266	265-7	
27	27-0	01-3	87	86-9	04-3	147	146-8	07-2	207	206-8	10-2	267	266-7	
28	28-0	01-4	88	87-9	04-3	148	147-8	07-3	208	207-8	10-2	268	267-7	
29	29-0	01-4	89	88-9	04-4	149	148-8	07-3	209	208-8	10-3	269	268-7	
30	30-0	01-5	90	89-9	04-4	150	149-8	07-4	210	209-8	10-3	270	269-7	
31	31-0	01-5	91	90-9	04-5	151	150-8	07-4	211	210-7	10-4	271	270-7	
32	32-0	01-6	92	91-9	04-5	152	151-8	07-5	212	211-7	10-4	272	271-7	
33	33-0	01-6	93	92-9	04-6	153	152-8	07-5	213	212-7	10-5	273	272-7	
34	34-0	01-7	94	93-9	04-6	154	153-8	07-6	214	213-7	10-5	274	273-7	
35	35-0	01-7	95	94-9	04-7	155	154-8	07-6	215	214-7	10-6	275	274-7	
36	36-0	01-8	96	95-9	04-7	156	155-8	07-7	216	215-7	10-6	276	275-7	
37	37-0	01-8	97	96-9	04-8	157	156-8	07-7	217	216-7	10-7	277	276-7	
38	38-0	01-9	98	97-9	04-8	158	157-8	07-8	218	217-7	10-7	278	277-7	
39	39-0	01-9	99	98-9	04-9	159	158-8	07-8	219	218-7	10-8	279	278-7	
40	40-0	02-0	100	99-9	04-9	160	159-8	07-9	220	219-7	10-8	280	279-7	
41	41-0	02-0	101	100-9	05-0	161	160-8	07-9	221	220-7	10-8	281	280-7	
42	41-9	02-1	102	101-9	05-0	162	161-8	08-0	222	221-7	10-9	282	281-7	
43	42-9	02-1	103	102-9	05-1	163	162-8	08-0	223	222-7	10-9	283	282-7	
44	43-9	02-2	104	103-9	05-1	164	163-8	08-1	224	223-7	11-0	284	283-7	
45	44-9	02-2	105	104-9	05-2	165	164-8	08-1	225	224-7	11-0	285	284-7	
46	45-9	02-3	106	105-9	05-2	166	165-8	08-2	226	225-7	11-1	286	285-7	
47	46-9	02-3	107	106-9	05-3	167	166-8	08-2	227	226-7	11-1	287	286-7	
48	47-9	02-4	108	107-9	05-3	168	167-8	08-2	228	227-7	11-2	288	287-7	
49	48-9	02-4	109	108-9	05-4	169	168-8	08-3	229	228-7	11-2	289	288-7	
50	49-9	02-5	110	109-9	05-4	170	169-8	08-3	230	229-7	11-3	290	289-7	
51	50-9	02-5	111	110-9	05-5	171	170-8	08-4	231	230-7	11-3	291	290-7	
52	51-9	02-6	112	111-9	05-5	172	171-8	08-4	232	231-7	11-4	292	291-7	
53	52-9	02-6	113	112-9	05-5	173	172-8	08-5	233	232-7	11-4	293	292-7	
54	53-9	02-7	114	113-9	05-6	174	173-8	08-5	234	233-7	11-5	294	293-7	
55	54-9	02-7	115	114-9	05-6	175	174-8	08-6	235	234-7	11-5	295	294-7	
56	55-9	02-8	116	115-9	05-7	176	175-8	08-6	236	235-7	11-6	296	295-7	
57	56-9	02-8	117	116-9	05-7	177	176-8	08-7	237	236-7	11-6	297	296-7	
58	57-9	02-9	118	117-9	05-8	178	177-8	08-7	238	237-7	11-7	298	297-7	
59	58-9	02-9	119	118-9	05-8	179	178-8	08-8	239	238-7	11-7	299	298-7	
60	59-9	02-9	120	119-9	05-9	180	179-8	08-8	240	239-7	11-8	300	299-7	
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 73 POINTS.

FOR $7\frac{1}{2}$ POINTS.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01°0'	00'1	61	60°7'	06'0	121	120°4'	11'9	181	180°1'	17'7	241	239°8'	23'6			
2	02°0'	00'2	62	61°7'	06'1	122	121°4'	12'0	182	181°1'	17'8	242	240°8'	23'7			
3	03°0'	00'3	63	62°7'	06'2	123	122°4'	12'1	183	182°1'	17'9	243	241°8'	23'8			
4	04°0'	00'4	64	63°7'	06'3	124	123°4'	12'2	184	183°1'	18'0	244	242°8'	23'9			
5	05°0'	00'5	65	64°7'	06'4	125	124°4'	12'3	185	184°1'	18'1	245	243°8'	24'0			
6	06°0'	00'6	66	65°7'	06'5	126	125°4'	12'3	186	185°1'	18'2	246	244°8'	24'1			
7	07°0'	00'7	67	66°7'	06'6	127	126°4'	12'4	187	186°1'	18'3	247	245°8'	24'2			
8	08°0'	00'8	68	67°7'	06'7	128	127°4'	12'5	188	187°1'	18'4	248	246°8'	24'3			
9	09°0'	00'9	69	68°7'	06'8	129	128°4'	12'6	189	188°1'	18'5	249	247°8'	24'4			
10	10°0'	01'0	70	69°7'	06'9	130	129°4'	12'7	190	189°1'	18'6	250	248°8'	24'5			
11	10°9'	01'1	71	70°7'	07'0	131	130°4'	12'8	191	190°1'	18'7	251	249°8'	24'6			
12	11°9'	01'2	72	71°7'	07'1	132	131°4'	12'9	192	191°1'	18'8	252	250°8'	24'7			
13	12°9'	01'3	73	72°7'	07'2	133	132°4'	13'0	193	192°1'	18'9	253	251°8'	24'8			
14	13°9'	01'4	74	73°7'	07'3	134	133°4'	13'1	194	193°1'	19'0	254	252°8'	24'9			
15	14°9'	01'5	75	74°7'	07'4	135	134°3'	13'2	195	194°1'	19'1	255	253°8'	25'0			
16	15°9'	01'6	76	75°7'	07'4	136	135°3'	13'3	196	195°1'	19'2	256	254°8'	25'1			
17	16°9'	01'7	77	76°7'	07'5	137	136°3'	13'4	197	196°1'	19'3	257	255°8'	25'2			
18	17°9'	01'8	78	77°7'	07'6	138	137°3'	13'5	198	197°0'	19'4	258	256°8'	25'3			
19	18°9'	01'9	79	78°7'	07'7	139	138°3'	13'6	199	198°0'	19'5	259	257°8'	25'4			
20	19°9'	02'0	80	79°7'	07'8	140	139°3'	13'7	200	199°0'	19'6	260	258°7'	25'5			
21	20°9'	02'1	81	80°6'	07'9	141	140°3'	13'8	201	200°0'	19'7	261	259°7'	25'6			
22	21°9'	02'2	82	81°6'	08'0	142	141°3'	13'9	202	201°0'	19'8	262	260°7'	25'7			
23	22°9'	02'3	83	82°6'	08'1	143	142°3'	14'0	203	202°0'	19'9	263	261°7'	25'8			
24	23°9'	02'4	84	83°6'	08'2	144	143°3'	14'1	204	203°0'	20'0	264	262°7'	25'9			
25	24°9'	02'4	85	84°6'	08'3	145	144°3'	14'2	205	204°0'	20'1	265	263°7'	26'0			
26	25°9'	02'5	86	85°6'	08'4	146	145°3'	14'3	206	205°0'	20'2	266	264°7'	26'1			
27	26°9'	02'6	87	86°6'	08'5	147	146°3'	14'4	207	206°0'	20'3	267	265°7'	26'2			
28	27°9'	02'7	88	87°6'	08'6	148	147°3'	14'5	208	207°0'	20'4	268	266°7'	26'3			
29	28°9'	02'8	89	88°6'	08'7	149	148°3'	14'6	209	208°0'	20'5	269	267°7'	26'4			
30	29°9'	02'9	90	89°6'	08'8	150	149°3'	14'7	210	209°0'	20'6	270	268°7'	26'5			
31	30°9'	03'0	91	90°6'	08'9	151	150°3'	14'8	211	210°0'	20'7	271	269°7'	26'6			
32	31°8'	03'1	92	91°6'	09'0	152	151°3'	14'9	212	211°0'	20'8	272	270°7'	26'7			
33	32°8'	03'2	93	92°6'	09'1	153	152°3'	15'0	213	212°0'	20'9	273	271°7'	26'8			
34	33°8'	03'3	94	93°5'	09'2	154	153°3'	15'1	214	213°0'	21'0	274	272°7'	26'9			
35	34°8'	03'4	95	94°5'	09'3	155	154°3'	15'2	215	214°0'	21'1	275	273°7'	27'0			
36	35°8'	03'5	96	95°5'	09'4	156	155°2'	15'3	216	215°0'	21'2	276	274°7'	27'1			
37	36°8'	03'6	97	96°5'	09'5	157	156°2'	15'4	217	216°0'	21'3	277	275°7'	27'2			
38	37°8'	03'7	98	97°5'	09'6	158	157°2'	15'5	218	216°9'	21'4	278	276°7'	27'3			
39	38°8'	03'8	99	98°5'	09'7	159	158°2'	15'6	219	217°9'	21'5	279	277°7'	27'4			
40	39°8'	03'9	100	99°5'	09'8	160	159°2'	15'7	220	218°9'	21'6	280	278°7'	27'5			
41	40°8'	04'0	101	100°5'	09'9	161	160°2'	15'8	221	219°9'	21'7	281	279°6'	27'6			
42	41°8'	04'1	102	101°5'	10'0	162	161°2'	15'9	222	220°9'	21'8	282	280°6'	27'7			
43	42°8'	04'2	103	102°5'	10'1	163	162°2'	16'0	223	221°9'	21'9	283	281°6'	27'8			
44	43°8'	04'3	104	103°5'	10'2	164	163°2'	16'1	224	222°9'	22'0	284	282°6'	27'9			
45	44°8'	04'4	105	104°5'	10'3	165	164°2'	16'2	225	223°9'	22'1	285	283°6'	28'0			
46	45°8'	04'5	106	105°5'	10'4	166	165°2'	16'3	226	224°9'	22'2	286	284°6'	28'1			
47	46°8'	04'6	107	106°5'	10'5	167	166°2'	16'4	227	225°9'	22'3	287	285°6'	28'2			
48	47°8'	04'7	108	107°5'	10'6	168	167°2'	16'5	228	226°9'	22'3	288	286°6'	28'3			
49	48°8'	04'8	109	108°5'	10'7	169	168°2'	16'6	229	227°9'	22'4	289	287°6'	28'4			
50	49°8'	04'9	110	109°5'	10'8	170	169°2'	16'7	230	228°9'	22'5	290	288°6'	28'5			
51	50°8'	05'0	111	110°5'	10'9	171	170°2'	16'8	231	229°9'	22'6	291	289°6'	28'6			
52	51°7'	05'1	112	111°5'	11'0	172	171°2'	16'9	232	230°9'	22'7	292	290°6'	28'7			
53	52°7'	05'2	113	112°5'	11'1	173	172°2'	17'0	233	231°9'	22'8	293	291°6'	28'8			
54	53°7'	05'3	114	113°5'	11'2	174	173°2'	17'1	234	232°9'	22'9	294	292°6'	28'9			
55	54°7'	05'4	115	114°4'	11'3	175	174°2'	17'2	235	233°9'	23'0	295	293°6'	29'0			
56	55°7'	05'5	116	115°4'	11'4	176	175°2'	17'3	236	234°9'	23'1	296	294°6'	29'1			
57	56°7'	05'6	117	116°4'	11'5	177	176°1'	17'4	237	235°9'	23'2	297	295°6'	29'2			
58	57°7'	05'7	118	117°4'	11'6	178	177°1'	17'4	238	236°9'	23'3	298	296°6'	29'3			
59	58°7'	05'8	119	118°4'	11'7	179	178°1'	17'5	239	237°8'	23'4	299	297°6'	29'4			
60	59°7'	05'9	120	119°4'	11'8	180	179°1'	17'6	240	238°8'	23'5	300	298°6'	29'5			
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 4. DIFFERENCE OF LATITUDE AND DEPARTURE FOR $\frac{1}{2}$ POINT. 27

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01.0	00.1	61	60.3	09.0	121	119.7	17.8	181	179.0	26.6	241	238.4	35.4
2	02.0	00.3	62	61.3	09.1	122	120.7	17.9	182	180.0	26.7	242	239.4	35.5
3	03.0	00.4	63	62.3	09.2	123	121.7	18.1	183	181.0	26.9	243	240.4	35.7
4	04.0	00.6	64	63.3	09.4	124	122.7	18.2	184	182.0	27.0	244	241.4	35.8
5	04.9	00.7	65	64.3	09.5	125	123.7	18.3	185	183.0	27.2	245	242.4	36.0
6	05.9	00.9	66	65.3	09.7	126	124.6	18.5	186	184.0	27.3	246	243.3	36.1
7	06.9	01.0	67	66.3	09.8	127	125.6	18.6	187	185.0	27.4	247	244.3	36.2
8	07.9	01.2	68	67.3	10.0	128	126.6	18.8	188	186.0	27.6	248	245.3	36.4
9	08.9	01.3	69	68.3	10.1	129	127.6	18.9	189	187.0	27.7	249	246.3	36.5
10	09.9	01.5	70	69.2	10.3	130	128.6	19.1	190	187.9	27.9	250	247.3	36.7
11	10.9	01.6	71	70.2	10.4	131	129.6	19.2	191	188.9	28.0	251	248.3	36.8
12	11.9	01.8	72	71.2	10.6	132	130.6	19.4	192	189.9	28.2	252	249.3	37.0
13	12.9	01.9	73	72.2	10.7	133	131.6	19.5	193	190.9	28.3	253	250.3	37.1
14	13.9	02.1	74	73.2	10.9	134	132.6	19.7	194	191.9	28.5	254	251.3	37.3
15	14.8	02.2	75	74.2	11.0	135	133.5	19.8	195	192.9	28.6	255	252.2	37.4
16	15.8	02.3	76	75.2	11.2	136	134.5	20.0	196	193.9	28.8	256	253.2	37.6
17	16.8	02.5	77	76.2	11.3	137	135.5	20.1	197	194.9	28.9	257	254.2	37.7
18	17.8	02.6	78	77.2	11.4	138	136.5	20.3	198	195.9	29.1	258	255.2	37.9
19	18.8	02.8	79	78.1	11.6	139	137.5	20.4	199	196.8	29.2	259	256.2	38.0
20	19.8	02.9	80	79.1	11.7	140	138.5	20.5	200	197.8	29.4	260	257.2	38.2
21	20.8	03.1	81	80.1	11.9	141	139.5	20.7	201	198.8	29.5	261	258.2	38.3
22	21.8	03.2	82	81.1	12.0	142	140.5	20.8	202	199.8	29.6	262	259.2	38.4
23	22.8	03.4	83	82.1	12.2	143	141.5	21.0	203	200.8	29.8	263	260.2	38.6
24	23.7	03.5	84	83.1	12.3	144	142.4	21.1	204	201.8	29.9	264	261.1	38.7
25	24.7	03.7	85	84.1	12.5	145	143.4	21.3	205	202.8	30.1	265	262.1	38.9
26	25.7	03.8	86	85.1	12.6	146	144.4	21.4	206	203.8	30.2	266	263.1	39.0
27	26.7	04.0	87	86.1	12.8	147	145.4	21.6	207	204.8	30.4	267	264.1	39.2
28	27.7	04.1	88	87.1	12.9	148	146.4	21.7	208	205.8	30.5	268	265.1	39.3
29	28.7	04.3	89	88.0	13.1	149	147.4	21.9	209	206.7	30.7	269	266.1	39.5
30	29.7	04.4	90	89.0	13.2	150	148.4	22.0	210	207.7	30.8	270	267.1	39.6
31	30.7	04.6	91	90.0	13.4	151	149.4	22.2	211	208.7	31.0	271	268.1	39.8
32	31.7	04.7	92	91.0	13.5	152	150.4	22.3	212	209.7	31.1	272	269.1	39.9
33	32.6	04.8	93	92.0	13.7	153	151.3	22.5	213	210.7	31.3	273	270.0	40.1
34	33.6	05.0	94	93.0	13.8	154	152.3	22.6	214	211.7	31.4	274	271.0	40.2
35	34.6	05.1	95	94.0	13.9	155	153.3	22.7	215	212.7	31.6	275	272.0	40.4
36	35.6	05.3	96	95.0	14.1	156	154.3	22.9	216	213.7	31.7	276	273.0	40.5
37	36.6	05.4	97	96.0	14.2	157	155.3	23.0	217	214.7	31.8	277	274.0	40.6
38	37.6	05.6	98	96.9	14.4	158	156.3	23.2	218	215.6	32.0	278	275.0	40.8
39	38.6	05.7	99	97.9	14.5	159	157.3	23.3	219	216.6	32.1	279	276.0	40.9
40	39.6	05.9	100	98.9	14.7	160	158.3	23.5	220	217.6	32.3	280	277.0	41.1
41	40.6	06.0	101	99.9	14.8	161	159.3	23.6	221	218.6	32.4	281	278.0	41.2
42	41.6	06.2	102	100.9	15.0	162	160.3	23.8	222	219.6	32.6	282	279.0	41.4
43	42.5	06.3	103	101.9	15.1	163	161.2	23.9	223	220.6	32.7	283	279.9	41.5
44	43.5	06.5	104	102.9	15.3	164	162.2	24.1	224	221.6	32.9	284	280.9	41.7
45	44.5	06.6	105	103.9	15.4	165	163.2	24.2	225	222.6	33.0	285	281.9	41.8
46	45.5	06.8	106	104.9	15.6	166	164.2	24.4	226	223.6	33.2	286	282.9	42.0
47	46.5	06.9	107	105.8	15.7	167	165.2	24.5	227	224.5	33.3	287	283.9	42.1
48	47.5	07.0	108	106.8	15.9	168	166.2	24.7	228	225.5	33.5	288	284.9	42.3
49	48.5	07.2	109	107.8	16.0	169	167.2	24.8	229	226.5	33.6	289	285.9	42.4
50	49.5	07.3	110	108.8	16.1	170	168.2	24.9	230	227.5	33.8	290	286.9	42.6
51	50.5	07.5	111	109.8	16.3	171	169.2	25.1	231	228.5	33.9	291	287.9	42.7
52	51.4	07.6	112	110.8	16.4	172	170.1	25.2	232	229.5	34.0	292	288.8	42.9
53	52.4	07.8	113	111.8	16.6	173	171.1	25.4	233	230.5	34.2	293	289.8	43.0
54	53.4	07.9	114	112.8	16.7	174	172.1	25.5	234	231.5	34.3	294	290.8	43.1
55	54.4	08.1	115	113.8	16.9	175	173.1	25.7	235	232.5	34.5	295	291.8	43.3
56	55.4	08.2	116	114.7	17.0	176	174.1	25.8	236	233.4	34.6	296	292.8	43.4
57	56.4	08.4	117	115.7	17.2	177	175.1	26.0	237	234.4	34.8	297	293.8	43.6
58	57.4	08.5	118	116.7	17.3	178	176.1	26.1	238	235.4	34.9	298	294.8	43.7
59	58.4	08.7	119	117.7	17.5	179	177.1	26.3	239	236.4	35.1	299	295.8	43.9
60	59.4	08.8	120	118.7	17.6	180	178.1	26.4	240	237.4	35.2	300	296.8	44.0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR $7\frac{1}{2}$ POINTS.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-7	06-0	121	120-4	11-9	181	180-1	17-7	241	239-8	23
2	02-0	00-2	62	61-7	06-1	122	121-4	12-0	182	181-1	17-8	242	240-3	23
3	03-0	00-3	63	62-7	06-2	123	122-4	12-1	183	182-1	17-9	243	241-8	23
4	04-0	00-4	64	63-7	06-3	124	123-4	12-2	184	183-1	18-0	244	242-8	23
5	05-0	00-5	65	64-7	06-4	125	124-4	12-3	185	184-1	18-1	245	243-8	23
6	06-0	00-6	66	65-7	06-5	126	125-4	12-3	186	185-1	18-2	246	244-8	23
7	07-0	00-7	67	66-7	06-6	127	126-4	12-4	187	186-1	18-3	247	245-8	23
8	08-0	00-8	68	67-7	06-7	128	127-4	12-5	188	187-1	18-4	248	246-8	23
9	09-0	00-9	69	68-7	06-8	129	128-4	12-6	189	188-1	18-5	249	247-8	23
10	10-0	01-0	70	69-7	06-9	130	129-4	12-7	190	189-1	18-6	250	248-8	23
11	10-9	01-1	71	70-7	07-0	131	130-4	12-8	191	190-1	18-7	251	249-8	23
12	11-9	01-2	72	71-7	07-1	132	131-4	12-9	192	191-1	18-8	252	250-8	23
13	12-9	01-3	73	72-6	07-2	133	132-4	13-0	193	192-1	18-9	253	251-8	23
14	13-9	01-4	74	73-6	07-3	134	133-4	13-1	194	193-1	19-0	254	252-8	23
15	14-9	01-5	75	74-6	07-4	135	134-3	13-2	195	194-1	19-1	255	253-8	23
16	15-9	01-6	76	75-6	07-4	136	135-3	13-3	196	195-1	19-2	256	254-8	23
17	16-9	01-7	77	76-6	07-5	137	136-3	13-4	197	196-1	19-3	257	255-8	23
18	17-9	01-8	78	77-6	07-6	138	137-3	13-5	198	197-0	19-4	258	256-8	23
19	18-9	01-9	79	78-6	07-7	139	138-3	13-6	199	198-0	19-5	259	257-8	23
20	19-9	02-0	80	79-6	07-8	140	139-3	13-7	200	199-0	19-6	260	258-8	23
21	20-9	02-1	81	80-6	07-9	141	140-3	13-8	201	200-0	19-7	261	259-8	23
22	21-9	02-2	82	81-6	08-0	142	141-3	13-9	202	201-0	19-8	262	260-8	23
23	22-9	02-3	83	82-6	08-1	143	142-3	14-0	203	202-0	19-9	263	261-8	23
24	23-9	02-4	84	83-6	08-2	144	143-3	14-1	204	203-0	20-0	264	262-8	23
25	24-9	02-4	85	84-6	08-3	145	144-3	14-2	205	204-0	20-1	265	263-8	23
26	25-9	02-5	86	85-6	08-4	146	145-3	14-3	206	205-0	20-2	266	264-8	23
27	26-9	02-6	87	86-6	08-5	147	146-3	14-4	207	206-0	20-3	267	265-8	23
28	27-9	02-7	88	87-6	08-6	148	147-3	14-5	208	207-0	20-4	268	266-8	23
29	28-9	02-8	89	88-6	08-7	149	148-3	14-6	209	208-0	20-5	269	267-8	23
30	29-9	02-9	90	89-6	08-8	150	149-3	14-7	210	209-0	20-6	270	268-8	23
31	30-9	03-0	91	90-6	08-9	151	150-3	14-8	211	210-0	20-7	271	269-8	23
32	31-8	03-1	92	91-6	09-0	152	151-3	14-9	212	211-0	20-8	272	270-8	23
33	32-8	03-2	93	92-6	09-1	153	152-3	15-0	213	212-0	20-9	273	271-8	23
34	33-8	03-3	94	93-6	09-2	154	153-3	15-1	214	213-0	21-0	274	272-8	23
35	34-8	03-4	95	94-6	09-3	155	154-3	15-2	215	214-0	21-1	275	273-8	23
36	35-8	03-5	96	95-6	09-4	156	155-2	15-3	216	215-0	21-2	276	274-8	23
37	36-8	03-6	97	96-6	09-5	157	156-2	15-4	217	216-0	21-3	277	275-8	23
38	37-8	03-7	98	97-6	09-6	158	157-2	15-5	218	216-9	21-4	278	276-8	23
39	38-8	03-8	99	98-6	09-7	159	158-2	15-6	219	217-9	21-5	279	277-8	23
40	39-8	03-9	100	99-6	09-8	160	159-2	15-7	220	218-9	21-6	280	278-8	23
41	40-8	04-0	101	100-6	09-9	161	160-2	15-8	221	219-9	21-7	281	279-8	23
42	41-8	04-1	102	101-6	10-0	162	161-2	15-9	222	220-9	21-8	282	280-8	23
43	42-8	04-2	103	102-6	10-1	163	162-2	16-0	223	221-9	21-9	283	281-8	23
44	43-8	04-3	104	103-6	10-2	164	163-2	16-1	224	222-9	22-0	284	282-8	23
45	44-8	04-4	105	104-6	10-3	165	164-2	16-2	225	223-9	22-1	285	283-8	23
46	45-8	04-5	106	105-6	10-4	166	165-2	16-3	226	224-9	22-2	286	284-8	23
47	46-8	04-6	107	106-6	10-5	167	166-2	16-4	227	225-9	22-3	287	285-8	23
48	47-8	04-7	108	107-6	10-6	168	167-2	16-5	228	226-9	22-4	288	286-8	23
49	48-8	04-8	109	108-6	10-7	169	168-2	16-6	229	227-9	22-5	289	287-8	23
50	49-8	04-9	110	109-6	10-8	170	169-2	16-7	230	228-9	22-6	290	288-8	23
51	50-8	05-0	111	110-6	10-9	171	170-2	16-8	231	229-9	22-7	291	289-8	23
52	51-7	05-1	112	111-5	11-0	172	171-2	16-9	232	230-9	22-8	292	290-8	23
53	52-7	05-2	113	112-5	11-1	173	172-2	17-0	233	231-9	22-9	293	291-8	23
54	53-7	05-3	114	113-5	11-2	174	173-2	17-1	234	232-9	23-0	294	292-8	23
55	54-7	05-4	115	114-4	11-3	175	174-2	17-2	235	233-9	23-1	295	293-8	23
56	55-7	05-5	116	115-4	11-4	176	175-2	17-3	236	234-9	23-2	296	294-8	23
57	56-7	05-6	117	116-4	11-5	177	176-1	17-4	237	235-9	23-3	297	295-8	23
58	57-7	05-7	118	117-4	11-6	178	177-1	17-5	238	236-9	23-4	298	296-8	23
59	58-7	05-8	119	118-4	11-7	179	178-1	17-6	239	237-8	23-5	299	297-8	23
60	59-7	05-9	120	119-4	11-8	180	179-1	17-7	240	238-8	23-6	300	298-8	23
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 4. DIFFERENCE OF LATITUDE AND DEPARTURE FOR $\frac{1}{2}$ POINT. 27

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-3	09-0	121	119-7	17-8	181	179-0	26-6	241	238-4	35-4
2	02-0	00-3	62	61-3	09-1	122	120-7	17-9	182	180-0	26-7	242	239-4	35-5
3	03-0	00-4	63	62-3	09-2	123	121-7	18-1	183	181-0	26-9	243	240-4	35-7
4	04-0	00-6	64	63-3	09-4	124	122-7	18-2	184	182-0	27-0	244	241-4	35-8
5	04-9	00-7	65	64-3	09-5	125	123-7	18-3	185	183-0	27-2	245	242-4	36-0
6	05-9	00-9	66	65-3	09-7	126	124-6	18-5	186	184-0	27-3	246	243-3	36-1
7	06-9	01-0	67	66-3	09-8	127	125-6	18-6	187	185-0	27-4	247	244-3	36-2
8	07-9	01-2	68	67-3	10-0	128	126-6	18-8	188	186-0	27-6	248	245-3	36-4
9	08-9	01-3	69	68-3	10-1	129	127-6	18-9	189	187-0	27-7	249	246-3	36-5
10	09-9	01-5	70	69-2	10-3	130	128-6	19-1	190	187-9	27-9	250	247-3	36-7
11	10-9	01-6	71	70-2	10-4	131	129-6	19-2	191	188-9	28-0	251	248-3	36-8
12	11-9	01-8	72	71-2	10-6	132	130-6	19-4	192	189-9	28-2	252	249-3	37-0
13	12-9	01-9	73	72-2	10-7	133	131-6	19-5	193	190-9	28-3	253	250-3	37-1
14	13-9	02-1	74	73-2	10-9	134	132-6	19-7	194	191-9	28-5	254	251-3	37-3
15	14-8	02-2	75	74-2	11-0	135	133-5	19-8	195	192-9	28-6	255	252-2	37-4
16	15-8	02-3	76	75-2	11-2	136	134-5	20-0	196	193-9	28-8	256	253-2	37-6
17	16-8	02-5	77	76-2	11-3	137	135-5	20-1	197	194-9	28-9	257	254-2	37-7
18	17-8	02-6	78	77-2	11-4	138	136-5	20-3	198	195-9	29-1	258	255-2	37-9
19	18-8	02-8	79	78-1	11-6	139	137-5	20-4	199	196-8	29-2	259	256-2	38-0
20	19-8	02-9	80	79-1	11-7	140	138-5	20-5	200	197-8	29-4	260	257-2	38-2
21	20-8	03-1	81	80-1	11-9	141	139-5	20-7	201	198-8	29-5	261	258-2	38-3
22	21-8	03-2	82	81-1	12-0	142	140-5	20-8	202	199-8	29-6	262	259-2	38-4
23	22-8	03-4	83	82-1	12-2	143	141-5	21-0	203	200-8	29-8	263	260-2	38-6
24	23-7	03-5	84	83-1	12-3	144	142-4	21-1	204	201-8	29-9	264	261-1	38-7
25	24-7	03-7	85	84-1	12-5	145	143-4	21-3	205	202-8	30-1	265	262-1	38-9
26	25-7	03-8	86	85-1	12-6	146	144-4	21-4	206	203-8	30-2	266	263-1	39-0
27	26-7	04-0	87	86-1	12-8	147	145-4	21-6	207	204-8	30-4	267	264-1	39-2
28	27-7	04-1	88	87-1	12-9	148	146-4	21-7	208	205-8	30-5	268	265-1	39-3
29	28-7	04-3	89	88-0	13-1	149	147-4	21-9	209	206-7	30-7	269	266-1	39-5
30	29-7	04-4	90	89-0	13-2	150	148-4	22-0	210	207-7	30-8	270	267-1	39-6
31	30-7	04-6	91	90-0	13-4	151	149-4	22-2	211	208-7	31-0	271	268-1	39-8
32	31-7	04-7	92	91-0	13-5	152	150-4	22-3	212	209-7	31-1	272	269-1	39-9
33	32-6	04-8	93	92-0	13-7	153	151-3	22-5	213	210-7	31-3	273	270-0	40-1
34	33-6	05-0	94	93-0	13-8	154	152-3	22-6	214	211-7	31-4	274	271-0	40-2
35	34-6	05-1	95	94-0	13-9	155	153-3	22-7	215	212-7	31-6	275	272-0	40-4
36	35-6	05-3	96	95-0	14-1	156	154-3	22-9	216	213-7	31-7	276	273-0	40-5
37	36-6	05-4	97	96-0	14-2	157	155-3	23-0	217	214-7	31-8	277	274-0	40-6
38	37-6	05-6	98	96-9	14-4	158	156-3	23-2	218	215-6	32-0	278	275-0	40-8
39	38-6	05-7	99	97-9	14-5	159	157-3	23-3	219	216-6	32-1	279	276-0	40-9
40	39-6	05-9	100	98-9	14-7	160	158-3	23-5	220	217-6	32-3	280	277-0	41-1
41	40-6	06-0	101	99-9	14-8	161	159-3	23-6	221	218-6	32-4	281	278-0	41-2
42	41-6	06-2	102	100-9	15-0	162	160-3	23-8	222	219-6	32-6	282	279-0	41-4
43	42-5	06-3	103	101-9	15-1	163	161-2	23-9	223	220-6	32-7	283	279-9	41-5
44	43-5	06-5	104	102-9	15-3	164	162-2	24-1	224	221-6	32-9	284	280-9	41-7
45	44-5	06-6	105	103-9	15-4	165	163-2	24-2	225	222-6	33-0	285	281-9	41-8
46	45-5	06-8	106	104-9	15-6	166	164-2	24-4	226	223-6	33-2	286	282-9	42-0
47	46-5	06-9	107	105-8	15-7	167	165-2	24-5	227	224-5	33-3	287	283-9	42-1
48	47-5	07-0	108	106-8	15-9	168	166-2	24-7	228	225-5	33-5	288	284-9	42-3
49	48-5	07-2	109	107-8	16-0	169	167-2	24-8	229	226-5	33-6	289	285-9	42-4
50	49-5	07-3	110	108-8	16-1	170	168-2	24-9	230	227-5	33-8	290	286-9	42-6
51	50-5	07-5	111	109-8	16-3	171	169-2	25-1	231	228-5	33-9	291	287-9	42-7
52	51-4	07-6	112	110-8	16-4	172	170-1	25-2	232	229-5	34-0	292	288-8	42-9
53	52-4	07-8	113	111-8	16-6	173	171-1	25-4	233	230-5	34-2	293	289-8	43-0
54	53-4	07-9	114	112-8	16-7	174	172-1	25-5	234	231-5	34-3	294	290-8	43-1
55	54-4	08-1	115	113-8	16-9	175	173-1	25-7	235	232-5	34-5	295	291-8	43-3
56	55-4	08-2	116	114-7	17-0	176	174-1	25-8	236	233-4	34-6	296	292-8	43-4
57	56-4	08-4	117	115-7	17-2	177	175-1	26-0	237	234-4	34-8	297	293-8	43-6
58	57-4	08-5	118	116-7	17-3	178	176-1	26-1	238	235-4	34-9	298	294-8	43-7
59	58-4	08-7	119	117-7	17-5	179	177-1	26-3	239	236-4	35-1	299	295-8	43-9
60	59-4	08-8	120	118-7	17-6	180	178-1	26-4	240	237-4	35-2	300	296-8	44-0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR $7\frac{1}{2}$ POINTS.

C 2

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-2	61	59-8	11-9	121	118-7	23-6	181	177-5	35-3	241	238-4	47-1
2	02-0	00-4	62	60-8	12-1	122	119-7	23-8	182	178-5	35-5	242	239-4	47-2
3	03-0	00-6	63	61-8	12-3	123	120-6	24-0	183	179-5	35-7	243	240-3	47-3
4	03-9	00-8	64	62-8	12-5	124	121-6	24-2	184	180-5	35-9	244	241-3	47-4
5	04-9	01-0	65	63-8	12-7	125	122-6	24-4	185	181-5	36-1	245	242-3	47-5
6	05-9	01-2	66	64-7	12-9	126	123-6	24-6	186	182-4	36-3	246	243-2	47-6
7	06-9	01-4	67	65-7	13-1	127	124-6	24-8	187	183-4	36-5	247	244-2	47-7
8	07-8	01-6	68	66-7	13-3	128	125-5	25-0	188	184-4	36-7	248	245-2	47-8
9	08-8	01-8	69	67-7	13-5	129	126-5	25-2	189	185-4	36-9	249	246-2	47-9
10	09-8	02-0	70	68-7	13-7	130	127-5	25-4	190	186-4	37-1	250	247-2	48-0
11	10-8	02-2	71	69-6	13-9	131	128-5	25-6	191	187-3	37-3	251	248-2	48-1
12	11-8	02-3	72	70-6	14-0	132	129-5	25-8	192	188-3	37-5	252	249-2	48-2
13	12-8	02-5	73	71-6	14-2	133	130-5	26-0	193	189-3	37-7	253	250-2	48-3
14	13-7	02-7	74	72-6	14-4	134	131-4	26-1	194	190-3	37-8	254	251-1	48-4
15	14-7	02-9	75	73-6	14-6	135	132-4	26-3	195	191-3	38-0	255	252-1	48-5
16	15-7	03-1	76	74-5	14-8	136	133-4	26-5	196	192-2	38-2	256	253-1	48-6
17	16-7	03-3	77	75-5	15-0	137	134-4	26-7	197	193-2	38-4	257	254-1	48-7
18	17-7	03-5	78	76-5	15-2	138	135-4	26-9	198	194-2	38-6	258	255-0	48-8
19	18-6	03-7	79	77-5	15-4	139	136-3	27-1	199	195-2	38-8	259	256-0	48-9
20	19-6	03-9	80	78-5	15-6	140	137-3	27-3	200	196-2	39-0	260	257-0	49-0
21	20-6	04-1	81	79-4	15-8	141	138-3	27-5	201	197-1	39-2	261	258-0	49-1
22	21-6	04-3	82	80-4	16-0	142	139-3	27-7	202	198-1	39-4	262	259-0	49-2
23	22-6	04-5	83	81-4	16-2	143	140-3	27-9	203	199-1	39-6	263	260-0	49-3
24	23-5	04-7	84	82-4	16-4	144	141-2	28-1	204	200-1	39-8	264	261-0	49-4
25	24-5	04-9	85	83-4	16-6	145	142-2	28-3	205	201-1	40-0	265	262-0	49-5
26	25-5	05-1	86	84-4	16-8	146	143-2	28-5	206	202-0	40-2	266	263-0	49-6
27	26-5	05-3	87	85-3	17-0	147	144-2	28-7	207	203-0	40-4	267	264-0	49-7
28	27-5	05-5	88	86-3	17-2	148	145-2	28-9	208	204-0	40-6	268	265-0	49-8
29	28-4	05-7	89	87-3	17-4	149	146-1	29-1	209	205-0	40-8	269	266-0	49-9
30	29-4	05-9	90	88-3	17-6	150	147-1	29-3	210	206-0	41-0	270	267-0	50-0
31	30-4	06-0	91	89-3	17-8	151	148-1	29-5	211	207-0	41-2	271	268-0	50-1
32	31-4	06-2	92	90-2	18-0	152	149-1	29-7	212	207-9	41-4	272	269-0	50-2
33	32-4	06-4	93	91-2	18-1	153	150-1	29-9	213	208-9	41-6	273	270-0	50-3
34	33-4	06-6	94	92-2	18-3	154	151-0	30-0	214	209-9	41-8	274	271-0	50-4
35	34-3	06-8	95	93-2	18-5	155	152-0	30-2	215	210-9	41-9	275	272-0	50-5
36	35-3	07-0	96	94-2	18-7	156	153-0	30-4	216	211-9	42-1	276	273-0	50-6
37	36-3	07-2	97	95-1	18-9	157	154-0	30-6	217	212-8	42-3	277	274-0	50-7
38	37-3	07-4	98	96-1	19-1	158	155-0	30-8	218	213-8	42-5	278	275-0	50-8
39	38-3	07-6	99	97-1	19-3	159	156-0	31-0	219	214-8	42-7	279	276-0	50-9
40	39-2	07-8	100	98-1	19-5	160	156-9	31-2	220	215-8	42-9	280	277-0	51-0
41	40-2	08-0	101	99-1	19-7	161	157-9	31-4	221	216-8	43-1	281	278-0	51-1
42	41-2	08-2	102	100-0	19-9	162	158-9	31-6	222	217-7	43-3	282	279-0	51-2
43	42-2	08-4	103	101-0	20-1	163	159-9	31-8	223	218-7	43-5	283	280-0	51-3
44	43-2	08-6	104	102-0	20-3	164	160-9	32-0	224	219-7	43-7	284	281-0	51-4
45	44-1	08-8	105	103-0	20-5	165	161-8	32-2	225	220-7	43-9	285	282-0	51-5
46	45-1	09-0	106	104-0	20-7	166	162-8	32-4	226	221-7	44-1	286	283-0	51-6
47	46-1	09-2	107	104-9	20-9	167	163-8	32-6	227	222-6	44-3	287	284-0	51-7
48	47-1	09-4	108	105-9	21-1	168	164-8	32-8	228	223-6	44-5	288	285-0	51-8
49	48-1	09-6	109	106-9	21-3	169	165-8	33-0	229	224-6	44-7	289	286-0	51-9
50	49-0	09-8	110	107-9	21-5	170	166-7	33-2	230	225-6	44-9	290	287-0	52-0
51	50-0	10-0	111	108-9	21-7	171	167-7	33-4	231	226-6	45-1	291	288-0	52-1
52	51-0	10-1	112	109-9	21-9	172	168-7	33-6	232	227-6	45-3	292	289-0	52-2
53	52-0	10-3	113	110-8	22-0	173	169-7	33-8	233	228-5	45-5	293	290-0	52-3
54	53-0	10-5	114	111-8	22-2	174	170-7	34-0	234	229-5	45-7	294	291-0	52-4
55	53-9	10-7	115	112-8	22-4	175	171-6	34-1	235	230-5	45-9	295	292-0	52-5
56	54-9	10-9	116	113-8	22-6	176	172-6	34-3	236	231-5	46-0	296	293-0	52-6
57	55-9	11-1	117	114-8	22-8	177	173-6	34-5	237	232-5	46-2	297	294-0	52-7
58	56-9	11-3	118	115-7	23-0	178	174-6	34-7	238	233-4	46-4	298	295-0	52-8
59	57-9	11-5	119	116-7	23-2	179	175-6	34-9	239	234-4	46-6	299	296-0	52-9
60	58-8	11-7	120	117-7	23-4	180	176-5	35-1	240	235-4	46-8	300	297-0	53-0
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 4. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 1¹/₂ POINT.

29

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-2	61	59-2	14-8	121	117-4	29-4	181	175-6	44-0	241	233-8	58-6
2	01-9	00-5	62	60-1	15-1	122	118-4	29-6	182	176-5	44-2	242	234-8	58-8
3	02-9	00-7	63	61-1	15-3	123	119-3	29-9	183	177-5	44-5	243	235-7	59-0
4	03-9	01-0	64	62-1	15-6	124	120-3	30-1	184	178-5	44-7	244	236-7	59-3
5	04-9	01-2	65	63-1	15-8	125	121-3	30-4	185	179-5	45-0	245	237-7	59-5
6	05-8	01-5	66	64-0	16-0	126	122-2	30-6	186	180-4	45-2	246	238-6	59-8
7	06-8	01-7	67	65-0	16-3	127	123-2	30-9	187	181-4	45-4	247	239-6	60-0
8	07-8	01-9	68	66-0	16-5	128	124-2	31-1	188	182-4	45-7	248	240-6	60-3
9	08-7	02-2	69	66-9	16-8	129	125-1	31-3	189	183-3	45-9	249	241-6	60-5
10	09-7	02-4	70	67-9	17-0	130	126-1	31-6	190	184-3	46-2	250	242-5	6-8
11	10-7	02-7	71	68-9	17-3	131	127-1	31-8	191	185-3	46-4	251	243-5	61-0
12	11-6	02-9	72	69-9	17-5	132	128-1	32-1	192	186-2	46-7	252	244-5	61-2
13	12-6	03-2	73	70-8	17-7	133	129-0	32-3	193	187-2	46-9	253	245-4	61-5
14	13-6	03-4	74	71-8	18-0	134	130-0	32-6	194	188-2	47-1	254	246-4	61-7
15	14-6	03-6	75	72-8	18-2	135	131-0	32-8	195	189-2	47-4	255	247-4	62-0
16	15-5	03-9	76	73-7	18-5	136	131-9	33-1	196	190-1	47-6	256	248-3	62-2
17	16-5	04-1	77	74-7	18-7	137	132-9	33-3	197	191-1	47-9	257	249-3	62-5
18	17-5	04-4	78	75-7	19-0	138	133-9	33-5	198	192-1	48-1	258	250-3	62-7
19	18-4	04-6	79	76-6	19-2	139	134-8	33-8	199	193-0	48-4	259	251-3	62-9
20	19-4	04-9	80	77-6	19-4	140	135-8	34-0	200	194-0	48-6	260	252-2	63-2
21	20-4	05-1	81	78-6	19-7	141	136-8	34-3	201	195-0	48-8	261	253-2	63-4
22	21-3	05-4	82	79-6	19-9	142	137-8	34-5	202	196-0	49-1	262	254-2	63-7
23	22-3	05-6	83	80-5	20-2	143	138-7	34-8	203	196-9	49-3	263	255-1	63-9
24	23-3	05-8	84	81-5	20-4	144	139-7	35-0	204	197-9	49-6	264	256-1	64-2
25	24-3	06-1	85	82-5	20-7	145	140-7	35-2	205	198-9	49-8	265	257-1	64-4
26	25-2	06-3	86	83-4	20-9	146	141-6	35-5	206	199-8	50-1	266	258-0	64-6
27	26-2	06-6	87	84-4	21-1	147	142-6	35-7	207	200-8	50-3	267	259-0	64-9
28	27-2	06-8	88	85-4	21-4	148	143-6	36-0	208	201-8	50-5	268	260-0	65-1
29	28-1	07-1	89	86-3	21-6	149	144-5	36-2	209	202-7	50-8	269	261-0	65-4
30	29-1	07-3	90	87-3	21-9	150	145-5	36-5	210	203-7	51-0	270	261-9	65-6
31	30-1	07-5	91	88-3	22-1	151	146-5	36-7	211	204-7	51-3	271	262-9	65-9
32	31-0	07-8	92	89-3	22-4	152	147-4	36-9	212	205-7	51-5	272	263-9	66-1
33	32-0	08-0	93	90-2	22-6	153	148-4	37-2	213	206-6	51-8	273	264-8	66-3
34	33-0	08-3	94	91-2	22-8	154	149-4	37-4	214	207-6	52-0	274	265-8	66-6
35	34-0	08-5	95	92-2	23-1	155	150-4	37-7	215	208-6	52-2	275	266-8	66-8
36	34-9	08-8	96	93-1	23-3	156	151-3	37-9	216	209-5	52-5	276	267-7	67-1
37	35-9	09-0	97	94-1	23-6	157	152-3	38-2	217	210-5	52-7	277	268-7	67-3
38	36-9	09-2	98	95-1	23-8	158	153-3	38-4	218	211-5	53-0	278	269-7	67-6
39	37-8	09-5	99	96-0	24-1	159	154-2	38-6	219	212-5	53-2	279	270-7	67-8
40	38-8	09-7	100	97-0	24-3	160	155-2	38-9	220	213-4	53-5	280	271-6	68-0
41	39-8	10-0	101	98-0	24-5	161	156-2	39-1	221	214-4	53-7	281	272-6	68-3
42	40-7	10-2	102	99-0	24-8	162	157-2	39-4	222	215-4	53-9	282	273-6	68-5
43	41-7	10-5	103	99-9	25-0	163	158-1	39-6	223	216-3	54-2	283	274-5	68-8
44	42-7	10-7	104	100-9	25-3	164	159-1	39-9	224	217-3	54-4	284	275-5	69-0
45	43-7	10-9	105	101-9	25-5	165	160-1	40-1	225	218-3	54-7	285	276-5	69-3
46	44-6	11-2	106	102-8	25-8	166	161-0	40-3	226	219-2	54-9	286	277-4	69-5
47	45-6	11-4	107	103-8	26-0	167	162-0	40-6	227	220-2	55-2	287	278-4	69-7
48	46-6	11-7	108	104-8	26-2	168	163-0	40-8	228	221-2	55-4	288	279-4	70-0
49	47-5	11-9	109	105-7	26-5	169	163-9	41-1	229	222-2	55-6	289	280-4	70-2
50	48-5	12-2	110	106-7	26-7	170	164-9	41-3	230	223-1	55-9	290	281-3	70-5
51	49-5	12-4	111	107-7	27-0	171	165-9	41-6	231	224-1	56-1	291	282-3	70-7
52	50-4	12-6	112	108-7	27-2	172	166-9	41-8	232	225-1	56-4	292	283-3	71-0
53	51-4	12-9	113	109-6	27-5	173	167-8	42-0	233	226-0	56-6	293	284-2	71-2
54	52-4	13-1	114	110-6	27-7	174	168-8	42-3	234	227-0	56-9	294	285-2	71-4
55	53-4	13-4	115	111-6	27-9	175	169-8	42-5	235	228-0	57-1	295	286-2	71-7
56	54-3	13-6	116	112-5	28-2	176	170-7	42-8	236	228-9	57-3	296	287-1	71-9
57	55-3	13-9	117	113-5	28-4	177	171-7	43-0	237	229-9	57-6	297	288-1	72-2
58	56-3	14-1	118	114-5	28-7	178	172-7	43-3	238	230-9	57-8	298	289-1	72-4
59	57-2	14-3	119	115-4	28-9	179	173-6	43-5	239	231-8	58-1	299	290-1	72-7
60	58-2	14-6	120	116-4	29-2	180	174-6	43-7	240	232-8	58-3	300	291-0	72-9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 6¹/₂ POINTS.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-3	61	5-4	17-7	121	115-8	35-1	181	173-2	52-5	241	230-6	70-0
2	01-9	00-6	62	59-3	18-0	122	116-8	35-4	182	174-2	52-8	242	231-6	70-3
3	02-9	00-9	63	60-3	18-3	123	117-7	35-7	183	175-1	53-1	243	232-5	70-6
4	03-8	01-2	64	61-2	18-6	124	118-7	36-0	184	176-1	53-4	244	233-5	70-9
5	04-8	01-5	65	62-2	18-9	125	119-6	36-3	185	177-0	53-7	245	234-5	71-1
6	05-7	01-7	66	63-2	19-2	126	120-6	36-6	186	178-0	54-0	246	235-4	71-4
7	06-7	02-0	67	64-1	19-5	127	121-5	36-9	187	179-0	54-3	247	236-4	71-7
8	07-7	02-3	68	65-1	19-7	128	122-5	37-2	188	179-9	54-6	248	237-3	72-0
9	08-6	02-6	69	66-0	20-0	129	123-5	37-5	189	180-9	54-9	249	238-3	72-3
10	09-6	02-9	70	67-0	20-3	130	124-4	37-7	190	181-8	55-2	250	239-2	72-6
11	10-5	03-2	71	67-9	20-6	131	125-4	38-0	191	182-8	55-4	251	240-2	72-9
12	11-5	03-5	72	68-9	20-9	132	126-3	38-3	192	183-7	55-7	252	241-2	73-2
13	12-4	03-8	73	69-9	21-2	133	127-3	38-6	193	184-7	56-0	253	242-1	73-5
14	13-4	04-1	74	70-8	21-5	134	128-2	38-9	194	185-7	56-3	254	243-1	73-8
15	14-4	04-4	75	71-8	21-8	135	129-2	39-2	195	186-6	56-6	255	244-0	74-0
16	15-3	04-6	76	72-7	22-1	136	130-1	39-5	196	187-6	56-9	256	245-0	74-3
17	16-3	04-9	77	73-7	22-4	137	131-1	39-8	197	188-5	57-2	257	245-9	74-6
18	17-2	05-2	78	74-6	22-6	138	132-1	40-1	198	189-5	57-5	258	246-9	74-9
19	18-2	05-5	79	75-6	22-9	139	133-0	40-4	199	190-4	57-8	259	247-9	75-2
20	19-1	05-8	80	76-6	23-2	140	134-0	40-6	200	191-4	58-1	260	248-8	75-5
21	20-1	06-1	81	77-5	23-5	141	134-9	40-9	201	192-3	58-4	261	249-8	75-8
22	21-1	06-4	82	78-5	23-8	142	135-9	41-2	202	193-3	58-6	262	250-7	76-1
23	22-0	6-7	83	79-4	24-1	143	136-8	41-5	203	194-3	58-9	263	251-7	76-4
24	23-0	07-0	84	80-4	24-4	144	137-8	41-8	204	195-2	59-2	264	252-6	76-7
25	23-9	07-3	85	81-3	24-7	145	138-8	42-1	205	196-2	59-5	265	253-6	77-0
26	24-9	07-6	86	82-3	25-0	146	139-7	42-4	206	197-1	59-8	266	254-6	77-3
27	25-8	07-8	87	83-3	25-3	147	140-7	42-7	207	198-1	60-1	267	255-5	77-6
28	26-8	08-1	88	84-2	25-5	148	141-6	43-0	208	199-0	60-4	268	256-5	77-9
29	27-8	08-4	89	85-2	25-8	149	142-6	43-3	209	200-0	60-7	269	257-4	78-2
30	28-7	08-7	90	86-1	26-1	150	143-5	43-5	210	201-0	61-0	270	258-4	78-5
31	29-7	09-0	91	87-1	26-4	151	144-5	43-8	211	201-9	61-3	271	259-3	78-8
32	30-6	09-3	92	88-0	26-7	152	145-5	44-1	212	202-9	61-6	272	260-3	79-1
33	31-6	09-6	93	89-0	27-0	153	146-4	44-4	213	203-8	61-9	273	261-2	79-4
34	32-5	09-9	94	90-0	27-3	154	147-4	44-7	214	204-8	62-1	274	262-2	79-7
35	33-5	10-2	95	90-9	27-6	155	148-3	45-0	215	205-7	62-4	275	263-2	79-9
36	34-5	10-5	96	91-9	27-9	156	149-3	45-3	216	206-7	62-7	276	264-1	80-1
37	35-4	10-7	97	92-8	28-2	157	150-2	45-6	217	207-7	63-0	277	265-1	80-4
38	36-4	11-0	98	93-8	28-5	158	151-2	45-9	218	208-6	63-3	278	266-0	80-7
39	37-3	11-3	99	94-7	28-7	159	152-2	46-2	219	209-6	63-6	279	267-0	81-0
40	38-3	11-6	100	95-7	29-0	160	153-1	46-4	220	210-5	63-9	280	267-9	81-3
41	39-2	11-9	101	96-7	29-3	161	154-1	46-7	221	211-5	64-2	281	268-9	81-6
42	40-2	12-2	102	97-6	29-6	162	155-0	47-0	222	212-4	64-4	282	269-9	81-9
43	41-2	12-5	103	98-6	29-9	163	156-0	47-3	223	213-4	64-7	283	270-8	82-2
44	42-1	12-8	104	99-5	30-2	164	156-9	47-6	224	214-4	65-0	284	271-8	82-4
45	43-1	13-1	105	100-5	30-5	165	157-9	47-9	225	215-3	65-3	285	272-7	82-7
46	44-0	13-4	106	101-4	30-8	166	158-9	48-2	226	216-3	65-6	286	273-7	83-0
47	45-0	13-6	107	102-4	31-1	167	159-8	48-5	227	217-2	65-9	287	274-6	83-3
48	45-9	13-9	108	103-4	31-4	168	160-8	48-8	228	218-2	66-2	288	275-6	83-6
49	46-9	14-2	109	104-3	31-6	169	161-7	49-1	229	219-1	66-5	289	276-6	83-9
50	47-9	14-5	110	105-3	31-9	170	162-7	49-4	230	220-1	66-8	290	277-5	84-2
51	48-8	14-8	111	106-2	32-2	171	163-6	49-6	231	221-1	67-1	291	278-5	84-5
52	49-8	15-1	112	107-2	32-5	172	164-6	49-9	232	222-0	67-3	292	279-4	84-8
53	50-7	15-4	113	108-1	32-8	173	165-6	50-2	233	223-0	67-6	293	280-4	85-0
54	51-7	15-7	114	109-1	33-1	174	166-5	50-5	234	223-9	67-9	294	281-3	85-3
55	52-6	16-0	115	110-1	33-4	175	167-5	50-8	235	224-9	68-2	295	282-3	85-6
56	53-6	16-3	116	111-0	33-7	176	168-4	51-1	236	225-8	68-5	296	283-3	85-9
57	54-6	16-6	117	112-0	34-0	177	169-4	51-4	237	226-8	68-8	297	284-2	86-2
58	55-5	16-8	118	112-9	34-3	178	170-3	51-7	238	227-8	69-1	298	285-2	86-5
59	56-5	17-1	119	113-9	34-5	179	171-3	52-0	239	228-7	69-4	299	286-1	86-8
60	57-4	17-4	120	114-8	34-8	180	172-3	52-3	240	229-7	69-7	300	287-1	87-1

TABLE 4. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 1° POINT.

31

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.9	00.3	61	57.4	20.6	121	113.9	40.8	181	170.4	61.0	241	236.9	81.2
2	01.9	00.7	62	58.4	20.9	122	114.9	41.1	182	171.4	61.3	242	237.9	81.5
3	02.8	01.0	63	59.3	21.2	123	115.8	41.4	183	172.3	61.7	243	238.8	81.9
4	03.8	01.4	64	60.3	21.6	124	116.8	41.8	184	173.2	62.0	244	239.7	82.2
5	04.7	01.7	65	61.2	21.9	125	117.7	42.1	185	174.2	62.3	245	240.7	82.5
6	05.7	02.0	66	62.1	22.2	126	118.6	42.5	186	175.1	62.7	246	241.6	82.9
7	06.6	02.4	67	63.1	22.6	127	119.6	42.8	187	176.1	63.0	247	242.6	83.2
8	07.5	02.7	68	64.0	22.9	128	120.5	43.1	188	177.0	63.3	248	243.5	83.6
9	08.5	03.0	69	65.0	23.3	129	121.5	43.5	189	177.9	63.7	249	244.4	83.9
10	09.4	03.4	70	65.9	23.6	130	122.4	43.8	190	178.9	64.0	250	245.4	84.2
11	10.4	03.7	71	66.9	23.9	131	123.3	44.1	191	179.8	64.4	251	246.3	84.6
12	11.3	04.0	72	67.8	24.3	132	124.3	44.5	192	180.8	64.7	252	247.3	84.9
13	12.2	04.4	73	68.7	24.6	133	125.2	44.8	193	181.7	65.0	253	248.2	85.2
14	13.2	04.7	74	69.7	24.9	134	126.2	45.1	194	182.7	65.4	254	249.1	85.6
15	14.1	05.1	75	70.6	25.3	135	127.1	45.5	195	183.6	65.7	255	250.1	85.9
16	15.1	05.4	76	71.6	25.6	136	128.1	45.8	196	184.5	66.0	256	251.0	86.2
17	16.0	05.7	77	72.5	25.9	137	129.0	46.2	197	185.5	66.4	257	252.0	86.6
18	17.0	06.1	78	73.4	26.3	138	129.9	46.5	198	186.4	66.7	258	252.9	86.9
19	17.9	06.4	79	74.4	26.6	139	130.9	46.8	199	187.4	67.0	259	253.9	87.3
20	18.8	06.7	80	75.3	27.0	140	131.8	47.2	200	188.3	67.4	260	244.8	87.6
21	19.8	07.1	81	76.3	27.3	141	132.8	47.5	201	189.3	67.7	261	245.7	87.9
22	20.7	07.4	82	77.2	27.6	142	133.7	47.8	202	190.2	68.1	262	246.7	88.3
23	21.7	07.8	83	78.2	28.0	143	134.6	48.2	203	191.1	68.4	263	247.6	88.6
24	22.6	08.1	84	79.1	28.3	144	135.6	48.5	204	192.1	68.7	264	248.6	88.9
25	23.5	08.4	85	80.0	28.6	145	136.5	48.9	205	193.0	69.1	265	249.5	89.3
26	24.5	08.8	86	81.0	29.0	146	137.5	49.2	206	194.0	69.4	266	250.5	89.6
27	25.4	09.1	87	81.9	29.3	147	138.4	49.5	207	194.9	69.7	267	251.4	90.0
28	26.4	09.4	88	82.9	29.7	148	139.4	49.9	208	195.8	70.1	268	252.3	90.3
29	27.3	09.8	89	83.8	30.0	149	140.3	50.2	209	196.8	70.4	269	253.3	90.6
30	28.3	10.1	90	84.7	30.3	150	141.2	50.5	210	197.7	70.8	270	254.2	91.0
31	29.2	10.4	91	85.7	30.7	151	142.2	50.9	211	198.7	71.1	271	255.2	91.3
32	30.1	10.8	92	86.6	31.0	152	143.1	51.2	212	199.6	71.4	272	256.1	91.6
33	31.1	11.1	93	87.6	31.3	153	144.1	51.5	213	200.6	71.8	273	257.0	92.0
34	32.0	11.5	94	88.5	31.7	154	145.0	51.9	214	201.5	72.1	274	258.0	92.3
35	33.0	11.8	95	89.5	32.0	155	145.9	52.2	215	202.4	72.4	275	258.9	92.6
36	33.9	12.1	96	90.4	32.3	156	146.9	52.6	216	203.4	72.8	276	259.9	93.0
37	34.8	12.5	97	91.3	32.7	157	147.8	52.9	217	204.3	73.1	277	260.8	93.3
38	35.8	12.8	98	92.3	33.0	158	148.8	53.2	218	205.3	73.4	278	261.8	93.7
39	36.7	13.1	99	93.2	33.4	159	149.7	53.6	219	206.2	73.8	279	262.7	94.0
40	37.7	13.5	100	94.2	33.7	160	150.7	53.9	220	207.1	74.1	280	263.6	94.3
41	38.6	13.8	101	95.1	34.0	161	151.6	54.2	221	208.1	74.5	281	264.6	94.7
42	39.5	14.2	102	96.0	34.4	162	152.5	54.6	222	209.0	74.8	282	265.5	95.0
43	40.5	14.5	103	97.0	34.7	163	153.5	54.9	223	210.0	75.1	283	266.5	95.3
44	41.4	14.8	104	97.9	35.0	164	154.4	55.3	224	210.9	75.5	284	267.4	95.7
45	42.4	15.2	105	98.9	35.4	165	155.4	55.6	225	211.9	75.8	285	268.3	96.0
46	43.3	15.5	106	99.8	35.7	166	156.3	55.9	226	212.8	76.1	286	269.3	96.4
47	44.3	15.8	107	100.7	36.1	167	157.2	56.3	227	213.7	76.5	287	270.2	96.7
48	45.2	16.2	108	101.7	36.4	168	158.2	56.6	228	214.7	76.8	288	271.2	97.0
49	46.1	16.5	109	102.6	36.7	169	159.1	56.9	229	215.6	77.2	289	272.1	97.4
50	47.1	16.8	110	103.6	37.1	170	160.1	57.3	230	216.6	77.5	290	273.0	97.7
51	48.0	17.2	111	104.5	37.4	171	161.0	57.6	231	217.5	77.8	291	274.0	98.0
52	49.0	17.5	112	105.5	37.7	172	161.9	58.0	232	218.4	78.2	292	274.9	98.4
53	49.9	17.9	113	106.4	38.1	173	162.9	58.3	233	219.4	78.5	293	275.9	98.7
54	50.8	18.2	114	107.3	38.4	174	163.8	58.6	234	220.3	78.8	294	276.8	99.0
55	51.8	18.5	115	108.3	38.7	175	164.8	59.0	235	221.3	79.2	295	277.8	99.4
56	52.7	18.9	116	109.2	39.1	176	165.7	59.3	236	222.2	79.5	296	278.7	99.7
57	53.7	19.2	117	110.2	39.4	177	166.7	59.6	237	223.1	79.8	297	279.6	100.1
58	54.6	19.5	118	111.1	39.8	178	167.6	60.0	238	224.1	80.2	298	280.6	100.4
59	55.6	19.9	119	112.0	40.1	179	168.5	60.3	239	225.0	80.5	299	281.5	100.7
60	56.5	20.2	120	113.0	40.4	180	169.5	60.6	240	226.0	80.9	300	282.5	101.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 6½ POINTS.

84 DIFFERENCE OF LATITUDE AND DEPARTURE FOR 24 POINTS. (TABLE 4)

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00-0	00-0	61	59-8	29-8	121	106-7	57-0	181	159-6	85-3	241	215-6	1136
2	01-0	00-9	62	54-7	29-2	122	107-6	57-5	182	160-5	85-6	242	215-4	1141
3	02-0	01-4	63	55-6	29-7	123	108-5	58-0	183	161-4	85-9	243	215-2	1146
4	03-0	01-9	64	56-4	30-3	124	109-4	58-4	184	162-3	86-2	244	215-0	1151
5	04-0	02-4	65	57-3	30-6	125	110-3	58-9	185	163-2	86-5	245	214-8	1156
6	05-0	02-8	66	58-2	31-1	126	111-1	59-4	186	164-0	86-8	246	214-6	1161
7	06-0	03-3	67	59-1	31-6	127	112-0	59-9	187	164-9	87-1	247	214-4	1166
8	07-1	03-8	68	60-0	32-1	128	112-9	60-3	188	165-8	87-4	248	214-2	1171
9	07-9	04-2	69	60-9	32-5	129	113-8	60-8	189	166-7	87-7	249	214-0	1176
10	08-8	04-7	70	61-7	33-0	130	114-7	61-3	190	167-6	88-0	250	213-8	1181
11	09-7	05-2	71	62-6	33-5	131	115-5	61-7	191	168-5	88-3	251	213-6	1186
12	10-6	05-7	72	63-5	33-9	132	116-4	62-2	192	169-3	88-6	252	213-4	1191
13	11-5	06-1	73	64-4	34-4	133	117-3	62-7	193	170-2	88-9	253	213-2	1196
14	12-3	06-6	74	65-3	34-9	134	118-2	63-2	194	171-1	89-2	254	213-0	1201
15	13-2	07-1	75	66-1	35-4	135	119-1	63-6	195	172-0	89-5	255	212-8	1206
16	14-1	07-5	76	67-0	35-8	136	119-9	64-1	196	172-9	89-8	256	212-6	1211
17	15-0	08-0	77	67-9	36-3	137	120-8	64-6	197	173-7	90-1	257	212-4	1216
18	15-9	08-5	78	68-8	36-8	138	121-7	65-0	198	174-6	90-4	258	212-2	1221
19	16-8	09-0	79	69-7	37-2	139	122-6	65-5	199	175-5	90-7	259	212-0	1226
20	17-6	09-4	80	70-6	37-7	140	123-5	66-0	200	176-4	91-0	260	211-8	1231
21	18-5	09-9	81	71-4	38-2	141	124-4	66-5	201	177-3	91-3	261	211-6	1236
22	19-4	10-4	82	72-3	38-6	142	125-2	66-9	202	178-2	91-6	262	211-4	1241
23	20-3	10-8	83	73-2	39-1	143	126-1	67-4	203	179-0	91-9	263	211-2	1246
24	21-2	11-3	84	74-1	39-6	144	127-0	67-9	204	179-9	92-2	264	211-0	1251
25	22-1	11-8	85	75-0	40-1	145	127-9	68-3	205	180-8	92-5	265	210-8	1256
26	23-0	12-3	86	75-9	40-5	146	128-8	68-8	206	181-7	92-8	266	210-6	1261
27	23-9	12-7	87	76-7	41-0	147	129-6	69-3	207	182-6	93-1	267	210-4	1266
28	24-7	13-2	88	77-6	41-5	148	130-5	69-8	208	183-4	93-4	268	210-2	1271
29	25-6	13-7	89	78-5	41-9	149	131-4	70-2	209	184-3	93-7	269	210-0	1276
30	26-5	14-1	90	79-4	42-4	150	132-3	70-7	210	185-2	94-0	270	209-8	1281
31	27-3	14-6	91	80-3	42-9	151	133-2	71-2	211	186-1	94-3	271	209-6	1286
32	28-2	15-1	92	81-1	43-4	152	134-1	71-6	212	187-0	94-6	272	209-4	1291
33	29-1	15-6	93	82-0	43-8	153	134-9	72-1	213	187-8	94-9	273	209-2	1296
34	30-0	16-0	94	82-9	44-3	154	135-8	72-6	214	188-7	95-2	274	209-0	1301
35	30-9	16-5	95	83-8	44-8	155	136-7	73-1	215	189-6	95-5	275	208-8	1306
36	31-8	17-0	96	84-7	45-2	156	137-6	73-5	216	190-5	95-8	276	208-6	1311
37	32-6	17-4	97	85-6	45-7	157	138-5	74-0	217	191-4	96-1	277	208-4	1316
38	33-5	17-9	98	86-4	46-2	158	139-3	74-5	218	192-3	96-4	278	208-2	1321
39	34-4	18-4	99	87-3	46-7	159	140-2	74-9	219	193-1	96-7	279	208-0	1326
40	35-3	18-9	100	88-2	47-1	160	141-1	75-4	220	194-0	97-0	280	207-8	1331
41	36-2	19-3	101	89-1	47-6	161	142-0	75-9	221	194-9	97-3	281	207-6	1336
42	37-0	19-8	102	90-0	48-1	162	142-9	76-4	222	195-8	97-6	282	207-4	1341
43	37-9	20-3	103	90-8	48-5	163	143-8	76-8	223	196-7	97-9	283	207-2	1346
44	38-8	20-7	104	91-7	49-0	164	144-6	77-3	224	197-6	98-2	284	207-0	1351
45	39-7	21-2	105	92-6	49-5	165	145-5	77-8	225	198-4	98-5	285	206-8	1356
46	40-6	21-7	106	93-5	50-0	166	146-4	78-2	226	199-3	98-8	286	206-6	1361
47	41-5	22-2	107	94-4	50-4	167	147-3	78-7	227	200-2	99-1	287	206-4	1366
48	42-3	22-6	108	95-3	50-9	168	148-2	79-2	228	201-1	99-4	288	206-2	1371
49	43-2	23-1	109	96-1	51-4	169	149-0	79-7	229	202-0	99-7	289	206-0	1376
50	44-1	23-6	110	97-0	51-8	170	149-9	80-1	230	202-8	100-0	290	205-8	1381
51	45-0	24-0	111	97-9	52-3	171	150-8	80-6	231	203-7	100-3	291	205-6	1386
52	45-9	24-5	112	98-8	52-8	172	151-7	81-1	232	204-6	100-6	292	205-4	1391
53	46-7	25-0	113	99-7	53-3	173	152-6	81-5	233	205-5	100-9	293	205-2	1396
54	47-6	25-5	114	100-5	53-7	174	153-5	82-0	234	206-4	101-2	294	205-0	1401
55	48-5	25-9	115	101-4	54-2	175	154-3	82-5	235	207-3	101-5	295	204-8	1406
56	49-4	26-4	116	102-3	54-7	176	155-2	83-0	236	208-1	101-8	296	204-6	1411
57	50-3	26-9	117	103-2	55-1	177	156-1	83-4	237	209-0	102-1	297	204-4	1416
58	51-2	27-3	118	104-1	55-6	178	157-0	83-9	238	209-9	102-4	298	204-2	1421
59	52-0	27-8	119	105-0	56-1	179	157-9	84-3	239	210-8	102-7	299	204-0	1426
60	52-9	28-3	120	105-9	56-6	180	158-8	84-8	240	211-7	103-0	300	203-8	1431

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 54 POINTS.

TABLE 4.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 22 POINTS. 35

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	009	005	61	523	314	121	1038	622	181	1553	930	241	2007	1239			
2	017	010	62	532	319	122	1046	627	182	1561	936	242	2017	1244			
3	026	015	63	540	324	123	1055	632	183	1570	941	243	2024	1249			
4	034	021	64	549	329	124	1064	637	184	1578	946	244	2033	1254			
5	043	026	65	558	334	125	1072	643	185	1587	951	245	2101	1259			
6	051	031	66	566	339	126	1081	648	186	1595	956	246	2110	1265			
7	060	036	67	575	344	127	1089	653	187	1604	961	247	2119	1270			
8	069	041	68	583	350	128	1098	658	188	1612	966	248	2127	1275			
9	077	046	69	592	355	129	1106	663	189	1621	972	249	2136	1280			
10	086	051	70	600	360	130	1115	668	190	1630	977	250	2144	1285			
11	094	057	71	609	365	131	1124	673	191	1638	982	251	2153	1290			
12	103	062	72	618	370	132	1132	679	192	1647	987	252	2161	1295			
13	112	067	73	626	375	133	1141	684	193	1655	992	253	2170	1301			
14	120	072	74	635	380	134	1149	689	194	1664	997	254	2179	1306			
15	129	077	75	643	386	135	1158	694	195	1673	1002	255	2187	1311			
16	137	082	76	652	391	136	1166	699	196	1681	1008	256	2196	1316			
17	146	087	77	660	396	137	1175	704	197	1690	1013	257	2204	1321			
18	154	093	78	669	401	138	1184	709	198	1698	1018	258	2213	1326			
19	163	098	79	678	406	139	1192	715	199	1707	1023	259	2222	1331			
20	172	103	80	686	411	140	1201	720	200	1715	1028	260	2230	1337			
21	180	108	81	695	416	141	1209	725	201	1724	1033	261	2239	1342			
22	189	113	82	703	421	142	1218	730	202	1733	1038	262	2247	1347			
23	197	118	83	712	427	143	1227	735	203	1741	1044	263	2256	1352			
24	206	123	84	720	432	144	1235	740	204	1750	1049	264	2264	1357			
25	214	129	85	729	437	145	1244	745	205	1758	1054	265	2273	1362			
26	223	134	86	738	442	146	1252	751	206	1767	1059	266	2282	1367			
27	232	139	87	746	447	147	1261	756	207	1775	1064	267	2290	1373			
28	240	144	88	755	452	148	1269	761	208	1784	1069	268	2299	1378			
29	249	149	89	763	457	149	1278	766	209	1793	1074	269	2307	1383			
30	257	154	90	772	463	150	1287	771	210	1801	1080	270	2316	1388			
31	266	159	91	781	468	151	1295	776	211	1810	1085	271	2324	1393			
32	274	165	92	789	473	152	1304	781	212	1818	1090	272	2333	1398			
33	283	170	93	798	478	153	1312	787	213	1827	1095	273	2342	1403			
34	292	175	94	806	483	154	1321	792	214	1835	1100	274	2350	1409			
35	300	180	95	815	488	155	1329	797	215	1844	1105	275	2359	1414			
36	309	185	96	823	493	156	1338	802	216	1853	1110	276	2367	1419			
37	317	190	97	832	499	157	1347	807	217	1861	1116	277	2376	1424			
38	326	195	98	841	504	158	1355	812	218	1870	1121	278	2384	1429			
39	335	201	99	849	509	159	1364	817	219	1878	1126	279	2393	1434			
40	343	206	100	858	514	160	1372	823	220	1887	1131	280	2402	1439			
41	352	211	101	866	519	161	1381	828	221	1896	1136	281	2410	1445			
42	360	216	102	875	524	162	1389	833	222	1904	1141	282	2419	1450			
43	369	221	103	883	529	163	1398	838	223	1913	1146	283	2427	1455			
44	377	226	104	892	535	164	1407	843	224	1921	1152	284	2436	1460			
45	386	231	105	901	540	165	1415	848	225	1930	1157	285	2444	1465			
46	395	236	106	909	545	166	1424	853	226	1938	1162	286	2453	1470			
47	403	242	107	918	550	167	1432	858	227	1947	1167	287	2462	1475			
48	412	247	108	926	555	168	1441	864	228	1956	1172	288	2470	1481			
49	420	252	109	935	560	169	1450	869	229	1964	1177	289	2479	1486			
50	429	257	110	943	565	170	1458	874	230	1973	1182	290	2487	1491			
51	437	262	111	952	571	171	1467	879	231	1981	1188	291	2496	1496			
52	446	267	112	961	576	172	1475	884	232	1990	1193	292	2505	1501			
53	455	272	113	969	581	173	1484	889	233	1998	1198	293	2513	1506			
54	463	278	114	978	586	174	1492	894	234	2007	1203	294	2522	1511			
55	472	283	115	986	591	175	1501	900	235	2016	1208	295	2530	1517			
56	480	288	116	995	596	176	1510	905	236	2024	1213	296	2539	1522			
57	489	293	117	1004	601	177	1518	910	237	2033	1218	297	2547	1527			
58	497	298	118	1012	607	178	1527	915	238	2041	1224	298	2556	1532			
59	506	303	119	1021	612	179	1535	920	239	2050	1229	299	2565	1537			
60	515	308	120	1029	617	180	1544	925	240	2059	1234	300	2573	1542			
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 54 POINTS.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°8	00°6	61	47°1	88°7	121	83°5	76°8	181	139°9	114°8	241	188°3	158°1
2	01°5	01°8	62	47°9	89°3	122	84°3	77°4	182	140°7	115°5	242	187°1	159°1
3	02°3	01°9	63	48°7	40°0	123	85°1	78°0	183	141°5	116°1	243	187°6	154°1
4	03°1	02°5	64	49°5	40°6	124	85°8	78°7	184	142°2	116°7	244	186°6	154°1
5	03°9	03°2	65	50°2	41°2	125	86°6	79°3	185	143°0	117°4	245	186°4	154°1
6	04°6	03°8	66	51°0	41°9	126	87°4	79°9	186	143°8	118°0	246	186°2	154°1
7	05°4	04°4	67	51°8	42°5	127	88°2	80°6	187	144°5	118°6	247	186°0	154°1
8	06°2	05°1	68	52°6	43°1	128	88°9	81°2	188	145°3	119°3	248	185°7	154°1
9	07°0	05°7	69	53°3	43°8	129	89°7	81°8	189	146°1	119°9	249	185°5	154°1
10	07°7	06°8	70	54°1	44°4	130	100°5	82°5	190	146°9	120°5	250	185°2	154°1
11	08°5	07°0	71	54°9	45°0	131	101°3	83°1	191	147°6	121°2	251	184°0	154°1
12	09°3	07°6	72	55°7	45°7	132	102°0	83°7	192	148°4	121°8	252	184°8	154°1
13	10°0	08°2	73	56°4	46°3	133	102°8	84°4	193	149°2	122°4	253	184°6	154°1
14	10°8	08°9	74	57°2	46°9	134	103°6	85°0	194	150°0	123°1	254	184°3	154°1
15	11°6	09°5	75	58°0	47°6	135	104°4	85°6	195	150°7	123°7	255	184°1	154°1
16	12°4	10°1	76	58°7	48°2	136	105°1	86°3	196	151°5	124°3	256	183°9	154°1
17	13°1	10°8	77	59°5	48°8	137	105°9	86°9	197	152°3	125°0	257	183°7	154°1
18	13°9	11°4	78	60°3	49°5	138	106°7	87°5	198	153°1	125°6	258	183°4	154°1
19	14°7	12°0	79	61°1	50°1	139	107°4	88°2	199	153°8	126°2	259	183°2	154°1
20	15°5	12°7	80	61°8	50°7	140	108°2	88°8	200	154°6	126°9	260	183°0	154°1
21	16°2	13°3	81	62°6	51°4	141	109°0	89°4	201	155°4	127°5	261	182°8	154°1
22	17°0	14°0	82	63°4	52°0	142	109°8	90°1	202	156°1	128°1	262	182°5	154°1
23	17°8	14°6	83	64°2	52°7	143	110°5	90°7	203	156°9	128°8	263	182°3	154°1
24	18°6	15°2	84	64°9	53°3	144	111°3	91°3	204	157°7	129°4	264	182°1	154°1
25	19°3	15°9	85	65°7	53°9	145	112°1	92°0	205	158°5	130°0	265	181°9	154°1
26	20°1	16°5	86	66°5	54°6	146	112°9	92°6	206	159°2	130°7	266	181°7	154°1
27	20°9	17°1	87	67°2	55°2	147	113°6	93°3	207	160°0	131°3	267	181°4	154°1
28	21°6	17°8	88	68°0	55°8	148	114°4	93°9	208	160°8	132°0	268	181°2	154°1
29	22°4	18°4	89	68°8	56°5	149	115°2	94°5	209	161°6	132°6	269	181°0	154°1
30	23°2	19°0	90	69°6	57°1	150	115°9	95°2	210	162°3	133°2	270	180°7	154°1
31	24°0	19°7	91	70°3	57°7	151	116°7	95°8	211	163°1	133°9	271	180°5	154°1
32	24°7	20°3	92	71°1	58°4	152	117°5	96°4	212	163°9	134°5	272	180°3	154°1
33	25°5	20°9	93	71°9	59°0	153	118°3	97°1	213	164°6	135°1	273	180°1	154°1
34	26°3	21°6	94	72°7	59°6	154	119°0	97°7	214	165°4	135°8	274	179°9	154°1
35	27°1	22°2	95	73°4	60°3	155	119°8	98°3	215	166°2	136°4	275	179°7	154°1
36	27°8	22°8	96	74°2	60°9	156	120°6	99°0	216	167°0	137°0	276	179°5	154°1
37	28°6	23°5	97	75°0	61°5	157	121°4	99°6	217	167°7	137°7	277	179°3	154°1
38	29°4	24°1	98	75°7	62°2	158	122°1	100°2	218	168°5	138°3	278	179°1	154°1
39	30°1	24°7	99	76°5	62°8	159	122°9	100°9	219	169°3	138°9	279	178°9	154°1
40	30°9	25°4	100	77°3	63°4	160	123°7	101°5	220	170°1	139°6	280	178°7	154°1
41	31°7	26°0	101	78°1	64°1	161	124°4	102°1	221	170°8	140°2	281	178°5	154°1
42	32°5	26°6	102	78°8	64°7	162	125°2	102°8	222	171°6	140°8	282	178°3	154°1
43	33°2	27°3	103	79°6	65°3	163	126°0	103°4	223	172°4	141°5	283	178°1	154°1
44	34°0	27°9	104	80°4	66°0	164	126°8	104°0	224	173°1	142°1	284	177°9	154°1
45	34°8	28°5	105	81°2	66°6	165	127°5	104°7	225	173°9	142°7	285	177°7	154°1
46	35°6	29°2	106	81°9	67°2	166	128°3	105°3	226	174°7	143°4	286	177°5	154°1
47	36°3	29°8	107	82°7	67°9	167	129°1	105°9	227	175°5	144°0	287	177°3	154°1
48	37°1	30°4	108	83°5	68°5	168	129°9	106°6	228	176°2	144°6	288	177°1	154°1
49	37°9	31°1	109	84°3	69°1	169	130°6	107°2	229	177°0	145°3	289	176°9	154°1
50	38°6	31°7	110	85°0	69°8	170	131°4	107°8	230	177°8	145°9	290	176°7	154°1
51	39°4	32°3	111	85°8	70°4	171	132°2	108°5	231	178°6	146°5	291	176°5	154°1
52	40°2	33°0	112	86°6	71°0	172	133°0	109°1	232	179°3	147°2	292	176°3	154°1
53	41°0	33°6	113	87°3	71°7	173	133°7	109°7	233	180°1	147°8	293	176°1	154°1
54	41°7	34°3	114	88°1	72°3	174	134°5	110°4	234	180°9	148°4	294	175°9	154°1
55	42°5	34°9	115	88°9	73°0	175	135°3	111°0	235	181°7	149°1	295	175°7	154°1
56	43°3	35°5	116	89°7	73°6	176	136°0	111°6	236	182°4	149°7	296	175°5	154°1
57	44°1	36°2	117	90°4	74°2	177	136°8	112°3	237	183°2	150°3	297	175°3	154°1
58	44°8	36°8	118	91°2	74°9	178	137°6	112°9	238	184°0	151°0	298	175°1	154°1
59	45°6	37°4	119	92°0	75°5	179	138°4	113°6	239	184°7	151°6	299	174°9	154°1
60	46°4	38°1	120	92°8	76°1	180	139°1	114°2	240	185°5	152°3	300	174°7	154°1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 4.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 32 POINTS. 39

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	007	007	61	45.2	41.0	121	89.6	81.3	181	134.1	121.5	241	178.6	161.8
2	015	013	62	45.9	41.6	122	90.4	81.9	182	134.8	122.2	242	179.3	162.5
3	022	020	63	46.7	42.3	123	91.1	82.6	183	135.6	122.9	243	180.0	163.2
4	030	027	64	47.4	43.0	124	91.9	83.3	184	136.3	123.6	244	180.8	163.9
5	037	034	65	48.2	43.8	125	92.6	83.9	185	137.1	124.2	245	181.5	164.6
6	044	040	66	48.9	44.3	126	93.4	84.6	186	137.8	124.9	246	182.3	165.3
7	052	047	67	49.6	45.0	127	94.1	85.3	187	138.6	125.6	247	183.0	165.9
8	059	054	68	50.4	45.7	128	94.8	86.0	188	139.3	126.2	248	183.8	166.5
9	067	060	69	51.1	46.3	129	95.6	86.6	189	140.0	126.9	249	184.5	167.2
10	074	067	70	51.9	47.0	130	96.3	87.3	190	140.8	127.6	250	185.2	167.9
11	082	074	71	52.6	47.7	131	97.1	88.0	191	141.5	128.3	251	186.0	168.5
12	089	081	72	53.3	48.3	132	97.8	88.6	192	142.3	128.9	252	186.7	169.2
13	096	087	73	54.1	49.0	133	98.5	89.3	193	143.0	129.6	253	187.5	169.9
14	104	094	74	54.8	49.7	134	99.3	90.0	194	143.7	130.3	254	188.2	170.6
15	111	101	75	55.6	50.4	135	100.0	9.7	195	144.5	130.9	255	188.9	171.2
16	119	107	76	56.3	51.0	136	100.8	9.3	196	145.2	131.6	256	189.7	171.9
17	126	114	77	57.0	51.7	137	101.5	9.9	197	146.0	132.3	257	190.4	172.6
18	133	121	78	57.8	52.4	138	102.2	9.2	198	146.7	133.0	258	191.2	173.2
19	141	128	79	58.5	53.0	139	103.0	9.3	199	147.4	133.6	259	191.9	173.9
20	148	134	80	59.3	53.7	140	103.7	94.0	200	148.2	134.3	260	192.6	174.6
21	156	141	81	60.0	54.4	141	104.5	94.7	201	148.9	135.0	261	193.4	175.3
22	163	148	82	60.8	55.1	142	105.2	95.4	202	149.7	135.6	262	194.1	175.9
23	170	154	83	61.5	55.7	143	106.0	96.0	203	150.4	136.3	263	194.9	176.6
24	178	161	84	62.2	56.4	144	106.7	96.7	204	151.1	137.0	264	195.6	177.3
25	185	168	85	63.0	57.1	145	107.4	97.4	205	151.9	137.7	265	196.3	178.0
26	193	175	86	63.7	57.7	146	108.2	98.0	206	152.6	138.3	266	197.1	178.6
27	200	181	87	64.5	58.4	147	108.9	98.7	207	153.4	139.0	267	197.8	179.3
28	207	188	88	65.2	59.1	148	109.7	99.4	208	154.1	139.7	268	198.6	180.0
29	215	195	89	65.9	59.8	149	110.4	100.1	209	154.9	140.3	269	199.3	180.6
30	222	201	90	66.7	60.4	150	111.1	100.7	210	155.6	141.0	270	200.1	181.3
31	230	208	91	67.4	61.1	151	111.9	101.4	211	156.3	141.7	271	200.8	182.0
32	237	215	92	68.2	61.8	152	112.6	102.1	212	157.1	142.4	272	201.5	182.7
33	244	222	93	68.9	62.4	153	113.4	102.7	213	157.8	143.0	273	202.3	183.3
34	252	228	94	69.6	63.1	154	114.1	103.4	214	158.6	143.7	274	203.0	184.0
35	259	235	95	70.4	63.8	155	114.8	104.1	215	159.3	144.4	275	203.8	184.7
36	267	242	96	71.1	64.5	156	115.6	104.8	216	160.0	145.0	276	204.5	185.3
37	274	248	97	71.9	65.1	157	116.3	105.4	217	160.8	145.7	277	205.2	186.0
38	282	255	98	72.6	65.8	158	117.1	106.1	218	161.5	146.4	278	206.0	186.7
39	289	262	99	73.3	66.5	159	117.8	106.8	219	162.3	147.1	279	206.7	187.4
40	296	269	100	74.1	67.2	160	118.5	107.4	220	163.0	147.7	280	207.5	188.0
41	304	275	101	74.8	67.8	161	119.3	108.1	221	163.7	148.4	281	208.2	188.7
42	311	282	102	75.6	68.5	162	120.0	108.8	222	164.5	149.1	282	208.9	189.4
43	319	289	103	76.3	69.2	163	120.8	109.5	223	165.2	149.7	283	209.7	190.0
44	326	295	104	77.1	69.8	164	121.5	110.1	224	166.0	150.4	284	210.4	190.7
45	333	302	105	77.8	70.5	165	122.3	110.8	225	166.7	151.1	285	211.2	191.4
46	341	309	106	78.5	71.2	166	123.0	111.5	226	167.4	151.8	286	211.9	192.1
47	348	316	107	79.3	71.8	167	123.7	112.1	227	168.2	152.4	287	212.6	192.7
48	356	322	108	80.0	72.5	168	124.5	112.8	228	168.9	153.1	288	213.4	193.4
49	363	329	109	80.8	73.2	169	125.2	113.5	229	169.7	153.8	289	214.1	194.1
50	370	336	110	81.5	73.9	170	126.0	114.2	230	170.4	154.5	290	214.9	194.7
51	378	342	111	82.2	74.5	171	126.7	114.8	231	171.2	155.1	291	215.6	195.4
52	385	349	112	83.0	75.2	172	127.4	115.5	232	171.9	155.8	292	216.4	196.1
53	393	356	113	83.7	75.9	173	128.2	116.2	233	172.6	156.5	293	217.1	196.8
54	400	363	114	84.5	76.5	174	128.9	116.8	234	173.4	157.1	294	217.8	197.4
55	407	369	115	85.2	77.2	175	129.7	117.5	235	174.1	157.8	295	218.6	198.1
56	415	376	116	85.9	77.9	176	130.4	118.2	236	174.9	158.5	296	219.3	198.8
57	422	383	117	86.7	78.6	177	131.1	118.9	237	175.6	159.1	297	220.1	199.4
58	430	389	118	87.4	79.2	178	131.9	119.5	238	176.3	159.8	298	220.8	200.1
59	437	396	119	88.2	79.9	179	132.6	120.2	239	177.1	160.5	299	221.5	200.8
60	445	403	120	88.9	80.6	180	133.4	120.9	240	177.8	161.2	300	222.3	201.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 41 POINTS.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	007	007	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	014	014	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	242	171.1	171.1
3	021	021	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	243	171.8	171.8
4	028	028	64	45.3	45.3	124	87.7	87.7	184	130.1	130.1	244	172.5	172.5
5	035	035	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	245	173.2	173.2
6	042	042	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	246	173.9	173.9
7	049	049	67	47.4	47.4	127	89.8	89.8	187	132.2	132.2	247	174.7	174.7
8	057	057	68	48.1	48.1	128	90.5	90.5	188	132.9	132.9	248	175.4	175.4
9	064	064	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	249	176.1	176.1
10	071	071	70	49.5	49.5	130	91.9	91.9	190	134.3	134.3	250	176.8	176.8
11	078	078	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	251	177.5	177.5
12	085	085	72	50.9	50.9	132	93.3	93.3	192	135.8	135.8	252	178.2	178.2
13	092	092	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	253	178.9	178.9
14	099	099	74	52.3	52.3	134	94.8	94.8	194	137.2	137.2	254	179.6	179.6
15	106	106	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	255	180.3	180.3
16	113	113	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	256	181.0	181.0
17	120	120	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	257	181.7	181.7
18	127	127	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	258	182.4	182.4
19	134	134	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	259	183.1	183.1
20	141	141	80	56.6	56.6	140	99.0	99.0	200	141.4	141.4	260	183.8	183.8
21	148	148	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.6	184.6
22	156	156	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	262	185.3	185.3
23	163	163	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	263	186.0	186.0
24	170	170	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	264	186.7	186.7
25	177	177	85	60.1	60.1	145	102.5	102.5	205	145.0	145.0	265	187.4	187.4
26	184	184	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	266	188.1	188.1
27	191	191	87	61.5	61.5	147	103.9	103.9	207	146.4	146.4	267	188.8	188.8
28	198	198	88	62.2	62.2	148	104.7	104.7	208	147.1	147.1	268	189.5	189.5
29	205	205	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	269	190.2	190.2
30	212	212	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	270	190.9	190.9
31	219	219	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	226	226	92	65.1	65.1	152	107.5	107.5	212	149.9	149.9	272	192.3	192.3
33	233	233	93	65.8	65.8	153	108.2	108.2	213	150.6	150.6	273	193.0	193.0
34	240	240	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	274	193.7	193.7
35	247	247	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	275	194.5	194.5
36	255	255	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	276	195.2	195.2
37	262	262	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	277	195.9	195.9
38	269	269	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	278	196.6	196.6
39	276	276	99	70.0	70.0	159	112.4	112.4	219	154.9	154.9	279	197.3	197.3
40	283	283	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	280	198.0	198.0
41	290	290	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	297	297	102	72.1	72.1	162	114.5	114.5	222	157.0	157.0	282	199.4	199.4
43	304	304	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	283	200.1	200.1
44	311	311	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	284	200.8	200.8
45	318	318	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	285	201.5	201.5
46	325	325	106	75.0	75.0	166	117.4	117.4	226	159.8	159.8	286	202.2	202.2
47	332	332	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	287	202.9	202.9
48	339	339	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	288	203.6	203.6
49	346	346	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	289	204.3	204.3
50	354	354	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	290	205.1	205.1
51	361	361	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	368	368	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	292	206.5	206.5
53	375	375	113	79.9	79.9	173	122.3	122.3	233	164.8	164.8	293	207.2	207.2
54	382	382	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	294	207.9	207.9
55	389	389	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	295	208.6	208.6
56	396	396	116	82.0	82.0	176	124.4	124.4	236	166.9	166.9	296	209.3	209.3
57	403	403	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	297	210.0	210.0
58	410	410	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	298	210.7	210.7
59	417	417	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	299	211.4	211.4
60	424	424	120	84.8	84.8	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 4 POINTS.

TABLE 5.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 1 DEGREE.

41

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-0	61	61-0	01-1	121	121-0	02-1	181	181-0	03-2	241	241-0	04-2
2	02-0	00-0	62	62-0	01-1	122	122-0	02-1	182	182-0	03-2	242	242-0	04-2
3	03-0	00-1	63	63-0	01-1	123	123-0	02-1	183	183-0	03-2	243	243-0	04-2
4	04-0	00-1	64	64-0	01-1	124	124-0	02-2	184	184-0	03-2	244	244-0	04-3
5	05-0	00-1	65	65-0	01-1	125	125-0	02-2	185	185-0	03-2	245	245-0	04-3
6	06-0	00-1	66	66-0	01-2	126	126-0	02-2	186	186-0	03-2	246	246-0	04-3
7	07-0	00-1	67	67-0	01-2	127	127-0	02-2	187	187-0	03-3	247	247-0	04-3
8	08-0	00-1	68	68-0	01-2	128	128-0	02-2	188	188-0	03-3	248	248-0	04-3
9	09-0	00-2	69	69-0	01-2	129	129-0	02-2	189	189-0	03-3	249	249-0	04-3
10	10-0	00-2	70	70-0	01-2	130	130-0	02-3	190	190-0	03-3	250	250-0	04-4
11	11-0	00-2	71	71-0	01-2	131	131-0	02-3	191	191-0	03-3	251	251-0	04-4
12	12-0	00-2	72	72-0	01-3	132	132-0	02-3	192	192-0	03-4	252	252-0	04-4
13	13-0	00-2	73	73-0	01-3	133	133-0	02-3	193	193-0	03-4	253	253-0	04-4
14	14-0	00-2	74	74-0	01-3	134	134-0	02-3	194	194-0	03-4	254	254-0	04-4
15	15-0	00-3	75	75-0	01-3	135	135-0	02-4	195	195-0	03-4	255	255-0	04-4
16	16-0	00-3	76	76-0	01-3	136	136-0	02-4	196	196-0	03-4	256	256-0	04-5
17	17-0	00-3	77	77-0	01-3	137	137-0	02-4	197	197-0	03-4	257	257-0	04-5
18	18-0	00-3	78	78-0	01-4	138	138-0	02-4	198	198-0	03-5	258	258-0	04-5
19	19-0	00-3	79	79-0	01-4	139	139-0	02-4	199	199-0	03-5	259	259-0	04-5
20	20-0	00-3	80	80-0	01-4	140	140-0	02-4	200	200-0	03-5	260	260-0	04-5
21	21-0	00-4	81	81-0	01-4	141	141-0	02-5	201	201-0	03-5	261	261-0	04-5
22	22-0	00-4	82	82-0	01-4	142	142-0	02-5	202	202-0	03-5	262	262-0	04-6
23	23-0	00-4	83	83-0	01-4	143	143-0	02-5	203	203-0	03-5	263	263-0	04-6
24	24-0	00-4	84	84-0	01-5	144	144-0	02-5	204	204-0	03-6	264	264-0	04-6
25	25-0	00-4	85	85-0	01-5	145	145-0	02-5	205	205-0	03-6	265	265-0	04-6
26	26-0	00-5	86	86-0	01-5	146	146-0	02-5	206	206-0	03-6	266	266-0	04-6
27	27-0	00-5	87	87-0	01-5	147	147-0	02-6	207	207-0	03-6	267	267-0	04-7
28	28-0	00-5	88	88-0	01-5	148	148-0	02-6	208	208-0	03-6	268	268-0	04-7
29	29-0	00-5	89	89-0	01-6	149	149-0	02-6	209	209-0	03-7	269	269-0	04-7
30	30-0	00-5	90	90-0	01-6	150	150-0	02-6	210	210-0	03-7	270	270-0	04-7
31	31-0	00-6	91	91-0	01-6	151	151-0	02-6	211	211-0	03-7	271	271-0	04-7
32	32-0	00-6	92	92-0	01-6	152	152-0	02-7	212	212-0	03-7	272	272-0	04-8
33	33-0	00-6	93	93-0	01-6	153	153-0	02-7	213	213-0	03-7	273	273-0	04-8
34	34-0	00-6	94	94-0	01-6	154	154-0	02-7	214	214-0	03-7	274	274-0	04-8
35	35-0	00-6	95	95-0	01-7	155	155-0	02-7	215	215-0	03-8	275	275-0	04-8
36	36-0	00-6	96	96-0	01-7	156	156-0	02-7	216	216-0	03-8	276	276-0	04-8
37	37-0	00-6	97	97-0	01-7	157	157-0	02-7	217	217-0	03-8	277	277-0	04-8
38	38-0	00-7	98	98-0	01-7	158	158-0	02-8	218	218-0	03-8	278	278-0	04-9
39	39-0	00-7	99	99-0	01-7	159	159-0	02-8	219	219-0	03-8	279	279-0	04-9
40	40-0	00-7	100	100-0	01-7	160	160-0	02-8	220	220-0	03-8	280	280-0	04-9
41	41-0	00-7	101	101-0	01-8	161	161-0	02-8	221	221-0	03-9	281	281-0	04-9
42	42-0	00-7	102	102-0	01-8	162	162-0	02-8	222	222-0	03-9	282	282-0	04-9
43	43-0	00-8	103	103-0	01-8	163	163-0	02-8	223	223-0	03-9	283	283-0	04-9
44	44-0	00-8	104	104-0	01-8	164	164-0	02-9	224	224-0	03-9	284	284-0	05-0
45	45-0	00-8	105	105-0	01-8	165	165-0	02-9	225	225-0	03-9	285	285-0	05-0
46	46-0	00-8	106	106-0	01-8	166	166-0	02-9	226	226-0	03-9	286	286-0	05-0
47	47-0	00-8	107	107-0	01-9	167	167-0	02-9	227	227-0	04-0	287	287-0	05-0
48	48-0	00-8	108	108-0	01-9	168	168-0	02-9	228	228-0	04-0	288	288-0	05-0
49	49-0	00-9	109	109-0	01-9	169	169-0	02-9	229	229-0	04-0	289	289-0	05-0
50	50-0	00-9	110	110-0	01-9	170	170-0	03-0	230	230-0	04-0	290	290-0	05-1
51	51-0	00-9	111	111-0	01-9	171	171-0	03-0	231	231-0	04-0	291	291-0	05-1
52	52-0	00-9	112	112-0	02-0	172	172-0	03-0	232	232-0	04-0	292	292-0	05-1
53	53-0	00-9	113	113-0	02-0	173	173-0	03-0	233	233-0	04-1	293	293-0	05-1
54	54-0	00-9	114	114-0	02-0	174	174-0	03-0	234	234-0	04-1	294	294-0	05-1
55	55-0	01-0	115	115-0	02-0	175	175-0	03-1	235	235-0	04-1	295	295-0	05-1
56	56-0	01-0	116	116-0	02-0	176	176-0	03-1	236	236-0	04-1	296	296-0	05-2
57	57-0	01-0	117	117-0	02-0	177	177-0	03-1	237	237-0	04-1	297	297-0	05-2
58	58-0	01-0	118	118-0	02-1	178	178-0	03-1	238	238-0	04-2	298	298-0	05-2
59	59-0	01-0	119	119-0	02-1	179	179-0	03-1	239	239-0	04-2	299	299-0	05-2
60	60-0	01-0	120	120-0	02-1	180	180-0	03-1	240	240-0	04-2	300	300-0	05-2
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 89 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-0	61	61-0	02-1	121	120-9	04-2	181	180-9	06-3	241	240-9	08-4
2	02-0	00-1	62	62-0	02-2	122	121-9	04-3	182	181-9	06-4	242	241-9	08-5
3	03-0	00-1	63	63-0	02-2	123	122-9	04-3	183	182-9	06-4	243	242-9	08-5
4	04-0	00-1	64	64-0	02-2	124	123-9	04-3	184	183-9	06-4	244	243-9	08-5
5	05-0	00-2	65	65-0	02-3	125	124-9	04-4	185	184-9	06-5	245	244-9	08-6
6	06-0	00-2	66	66-0	02-3	126	125-9	04-4	186	185-9	06-5	246	245-9	08-6
7	07-0	00-2	67	67-0	02-3	127	126-9	04-4	187	186-9	06-5	247	246-9	08-6
8	08-0	00-3	68	68-0	02-4	128	127-9	04-5	188	187-9	06-6	248	247-9	08-7
9	09-0	00-3	69	69-0	02-4	129	128-9	04-5	189	188-9	06-6	249	248-9	08-7
10	10-0	00-3	70	70-0	02-4	130	129-9	04-5	190	189-9	06-6	250	249-9	08-7
11	11-0	00-4	71	71-0	02-5	131	130-9	04-6	191	190-9	06-7	251	250-9	08-8
12	12-0	00-4	72	72-0	02-5	132	131-9	04-6	192	191-9	06-7	252	251-9	08-8
13	13-0	00-5	73	73-0	02-5	133	132-9	04-6	193	192-9	06-7	253	252-9	08-8
14	14-0	00-5	74	74-0	02-6	134	133-9	04-7	194	193-9	06-8	254	253-9	08-9
15	15-0	00-5	75	75-0	02-6	135	134-9	04-7	195	194-9	06-8	255	254-9	08-9
16	16-0	00-6	76	76-0	02-7	136	135-9	04-7	196	195-9	06-8	256	255-9	08-9
17	17-0	00-6	77	77-0	02-7	137	136-9	04-8	197	196-9	06-9	257	256-9	09-0
18	18-0	00-6	78	78-0	02-7	138	137-9	04-8	198	197-9	06-9	258	257-9	09-0
19	19-0	00-7	79	79-0	02-8	139	138-9	04-9	199	198-9	06-9	259	258-9	09-0
20	20-0	00-7	80	80-0	02-8	140	139-9	04-9	200	199-9	07-0	260	259-9	09-1
21	21-0	00-7	81	81-0	02-8	141	140-9	04-9	201	200-9	07-0	261	260-9	09-1
22	22-0	00-8	82	82-0	02-9	142	141-9	05-0	202	201-9	07-0	262	261-9	09-1
23	23-0	00-8	83	83-0	02-9	143	142-9	05-0	203	202-9	07-1	263	262-9	09-2
24	24-0	00-8	84	84-0	02-9	144	143-9	05-0	204	203-9	07-1	264	263-9	09-2
25	25-0	00-9	85	85-0	03-0	145	144-9	05-1	205	204-9	07-2	265	264-9	09-2
26	26-0	00-9	86	86-0	03-0	146	145-9	05-1	206	205-9	07-2	266	265-9	09-3
27	27-0	00-9	87	87-0	03-0	147	146-9	05-1	207	206-9	07-2	267	266-9	09-3
28	28-0	01-0	88	88-0	03-1	148	147-9	05-2	208	207-9	07-3	268	267-9	09-4
29	29-0	01-0	89	89-0	03-1	149	148-9	05-2	209	208-9	07-3	269	268-9	09-4
30	30-0	01-0	90	90-0	03-1	150	149-9	05-2	210	209-9	07-3	270	269-9	09-4
31	31-0	01-1	91	91-0	03-2	151	150-9	05-3	211	210-9	07-4	271	270-9	09-5
32	32-0	01-1	92	92-0	03-2	152	151-9	05-3	212	211-9	07-4	272	271-9	09-5
33	33-0	01-2	93	93-0	03-2	153	152-9	05-3	213	212-9	07-4	273	272-9	09-5
34	34-0	01-2	94	94-0	03-3	154	153-9	05-4	214	213-9	07-5	274	273-9	09-6
35	35-0	01-2	95	95-0	03-3	155	154-9	05-4	215	214-9	07-5	275	274-9	09-6
36	36-0	01-3	96	96-0	03-4	156	155-9	05-4	216	215-9	07-5	276	275-9	09-6
37	37-0	01-3	97	97-0	03-4	157	156-9	05-5	217	216-9	07-6	277	276-9	09-7
38	38-0	01-3	98	98-0	03-4	158	157-9	05-5	218	217-9	07-6	278	277-9	09-7
39	39-0	01-4	99	99-0	03-5	159	158-9	05-5	219	218-9	07-6	279	278-9	09-7
40	40-0	01-4	100	99-9	03-5	160	159-9	05-6	220	219-9	07-7	280	279-9	09-8
41	41-0	01-4	101	100-9	03-5	161	160-9	05-6	221	220-9	07-7	281	280-9	09-8
42	42-0	01-5	102	101-9	03-6	162	161-9	05-7	222	221-9	07-7	282	281-9	09-9
43	43-0	01-5	103	102-9	03-6	163	162-9	05-7	223	222-9	07-8	283	282-9	09-9
44	44-0	01-5	104	103-9	03-6	164	163-9	05-7	224	223-9	07-8	284	283-9	09-9
45	45-0	01-6	105	104-9	03-7	165	164-9	05-8	225	224-9	07-9	285	284-9	10-0
46	46-0	01-6	106	105-9	03-7	166	165-9	05-8	226	225-9	07-9	286	285-9	10-0
47	47-0	01-6	107	106-9	03-7	167	166-9	05-8	227	226-9	07-9	287	286-9	10-1
48	48-0	01-7	108	107-9	03-8	168	167-9	05-9	228	227-9	08-0	288	287-9	10-1
49	49-0	01-7	109	108-9	03-8	169	168-9	05-9	229	228-9	08-0	289	288-9	10-1
50	50-0	01-7	110	109-9	03-8	170	169-9	05-9	230	229-9	08-0	290	289-9	10-2
51	51-0	01-8	111	110-9	03-9	171	170-9	06-0	231	230-9	08-1	291	290-9	10-2
52	52-0	01-8	112	111-9	03-9	172	171-9	06-0	232	231-9	08-1	292	291-9	10-2
53	53-0	01-8	113	112-9	03-9	173	172-9	06-0	233	232-9	08-1	293	292-9	10-2
54	54-0	01-9	114	113-9	04-0	174	173-9	06-1	234	233-9	08-2	294	293-9	10-3
55	55-0	01-9	115	114-9	04-0	175	174-9	06-1	235	234-9	08-2	295	294-9	10-3
56	56-0	02-0	116	115-9	04-0	176	175-9	06-1	236	235-9	08-2	296	295-9	10-3
57	57-0	02-0	117	116-9	04-1	177	176-9	06-2	237	236-9	08-3	297	296-9	10-4
58	58-0	02-0	118	117-9	04-1	178	177-9	06-2	238	237-9	08-3	298	297-9	10-4
59	59-0	02-1	119	118-9	04-2	179	178-9	06-2	239	238-9	08-3	299	298-9	10-4
60	60-0	02-1	120	119-9	04-2	180	179-9	06-3	240	239-9	08-4	300	299-9	10-5

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 88 DEGREE.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 3 DEGREES.

43

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-9	03-2	121	120-8	06-3	151	180-8	09-5	241	240-7	12-6
2	02-0	00-1	62	61-9	03-2	122	121-8	06-4	152	181-8	09-5	242	241-7	12-7
3	03-0	00-2	63	62-9	03-3	123	122-8	06-4	153	182-7	09-6	243	242-7	12-7
4	04-0	00-2	64	63-9	03-3	124	123-8	06-5	154	183-7	09-6	244	243-7	12-8
5	05-0	00-3	65	64-9	03-4	125	124-8	06-5	155	184-7	09-7	245	244-7	12-8
6	06-0	00-3	66	65-9	03-5	126	125-8	06-6	156	185-7	09-7	246	245-7	12-9
7	07-0	00-4	67	66-9	03-5	127	126-8	06-6	157	186-7	09-8	247	246-7	12-9
8	08-0	00-4	68	67-9	03-6	128	127-8	06-7	158	187-7	09-8	248	247-7	13-0
9	09-0	00-5	69	68-9	03-6	129	128-8	06-8	159	188-7	09-9	249	248-7	13-0
10	10-0	00-5	70	69-9	03-7	130	129-8	06-8	190	189-7	09-9	250	249-7	13-1
11	11-0	00-6	71	70-9	03-7	131	130-8	06-9	191	190-7	10-0	251	250-7	13-1
12	12-0	00-6	72	71-9	03-8	132	131-8	06-9	192	191-7	10-0	252	251-7	13-2
13	13-0	00-7	73	72-9	03-8	133	132-8	07-0	193	192-7	10-1	253	252-7	13-2
14	14-0	00-7	74	73-9	03-9	134	133-8	07-0	194	193-7	10-2	254	253-7	13-3
15	15-0	00-8	75	74-9	03-9	135	134-8	07-1	195	194-7	10-2	255	254-7	13-3
16	16-0	00-8	76	75-9	04-0	136	135-8	07-1	196	195-7	10-3	256	255-6	13-4
17	17-0	00-9	77	76-9	04-0	137	136-8	07-2	197	196-7	10-3	257	256-6	13-5
18	18-0	00-9	78	77-9	04-1	138	137-8	07-2	198	197-7	10-4	258	257-6	13-5
19	19-0	01-0	79	78-9	04-1	139	138-8	07-3	199	198-7	10-4	259	258-6	13-6
20	20-0	01-0	80	79-9	04-2	140	139-8	07-3	200	199-7	10-5	260	259-6	13-6
21	21-0	01-1	81	80-9	04-2	141	140-8	07-4	201	200-7	10-5	261	260-6	13-7
22	22-0	01-2	82	81-9	04-3	142	141-8	07-4	202	201-7	10-6	262	261-6	13-7
23	23-0	01-2	83	82-9	04-3	143	142-8	07-5	203	202-7	10-6	263	262-6	13-8
24	24-0	01-3	84	83-9	04-4	144	143-8	07-5	204	203-7	10-7	264	263-6	13-8
25	25-0	01-3	85	84-9	04-4	145	144-8	07-6	205	204-7	10-7	265	264-6	13-9
26	26-0	01-4	86	85-9	04-5	146	145-8	07-6	206	205-7	10-8	266	265-6	13-9
27	27-0	01-4	87	86-9	04-6	147	146-8	07-7	207	206-7	10-8	267	266-6	14-0
28	28-0	01-5	88	87-9	04-6	148	147-8	07-7	208	207-7	10-9	268	267-6	14-0
29	29-0	01-5	89	88-9	04-7	149	148-8	07-8	209	208-7	10-9	269	268-6	14-1
30	30-0	01-6	90	89-9	04-7	150	149-8	07-9	210	209-7	11-0	270	269-6	14-1
31	31-0	01-6	91	90-9	04-8	151	150-8	07-9	211	210-7	11-0	271	270-6	14-2
32	32-0	01-7	92	91-9	04-8	152	151-8	08-0	212	211-7	11-1	272	271-6	14-2
33	33-0	01-7	93	92-9	04-9	153	152-8	08-0	213	212-7	11-1	273	272-6	14-3
34	34-0	01-8	94	93-9	04-9	154	153-8	08-1	214	213-7	11-2	274	273-6	14-3
35	35-0	01-8	95	94-9	05-0	155	154-8	08-1	215	214-7	11-3	275	274-6	14-4
36	36-0	01-9	96	95-9	05-0	156	155-8	08-2	216	215-7	11-3	276	275-6	14-4
37	37-0	01-9	97	96-9	05-1	157	156-8	08-2	217	216-7	11-4	277	276-6	14-5
38	38-0	02-0	98	97-9	05-1	158	157-8	08-3	218	217-7	11-4	278	277-6	14-5
39	39-0	02-0	99	98-9	05-2	159	158-8	08-3	219	218-7	11-5	279	278-6	14-6
40	39-9	02-1	100	99-9	05-2	160	159-8	08-4	220	219-7	11-5	280	279-6	14-7
41	40-9	02-1	101	100-9	05-3	161	160-8	08-4	221	220-7	11-6	281	280-6	14-7
42	41-9	02-2	102	101-9	05-3	162	161-8	08-5	222	221-7	11-6	282	281-6	14-8
43	42-9	02-3	103	102-9	05-4	163	162-8	08-5	223	222-7	11-7	283	282-6	14-8
44	43-9	02-3	104	103-9	05-4	164	163-8	08-6	224	223-7	11-7	284	283-6	14-9
45	44-9	02-4	105	104-9	05-5	165	164-8	08-6	225	224-7	11-8	285	284-6	14-9
46	45-9	02-4	106	105-9	05-5	166	165-8	08-7	226	225-7	11-8	286	285-6	15-0
47	46-9	02-5	107	106-9	05-6	167	166-8	08-7	227	226-7	11-9	287	286-6	15-0
48	47-9	02-5	108	107-9	05-7	168	167-8	08-8	228	227-7	11-9	288	287-6	15-1
49	48-9	02-6	109	108-9	05-7	169	168-8	08-8	229	228-7	12-0	289	288-6	15-1
50	49-9	02-6	110	109-8	05-8	170	169-8	08-9	230	229-7	12-0	290	289-6	15-2
51	50-9	02-7	111	110-8	05-8	171	170-8	08-9	231	230-7	12-1	291	290-6	15-2
52	51-9	02-7	112	111-8	05-9	172	171-8	09-0	232	231-7	12-1	292	291-6	15-3
53	52-9	02-8	113	112-8	05-9	173	172-8	09-1	233	232-7	12-2	293	292-6	15-3
54	53-9	02-8	114	113-8	06-0	174	173-8	09-1	234	233-7	12-2	294	293-6	15-4
55	54-9	02-9	115	114-8	06-0	175	174-8	09-2	235	234-7	12-3	295	294-6	15-4
56	55-9	02-9	116	115-8	06-1	176	175-8	09-2	236	235-7	12-4	296	295-6	15-5
57	56-9	03-0	117	116-8	06-1	177	176-8	09-3	237	236-7	12-4	297	296-6	15-5
58	57-9	03-0	118	117-8	06-2	178	177-8	09-3	238	237-7	12-5	298	297-6	15-6
59	58-9	03-1	119	118-8	06-2	179	178-8	09-4	239	238-7	12-5	299	298-6	15-6
60	59-9	03-1	120	119-8	06-3	180	179-8	09-4	240	239-7	12-6	300	299-6	15-7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 87 DEGREES.

44 DIFFERENCE OF LATITUDE AND DEPARTURE FOR 4 DEGREES. [TABLE 5.]

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-9	04-3	121	120-7	08-4	181	180-6	12-6	241	240-4	168
2	02-0	00-1	62	61-8	04-3	122	121-7	08-5	182	181-6	12-7	242	241-4	169
3	03-0	00-2	63	62-8	04-4	123	122-7	08-6	183	182-6	12-8	243	242-4	170
4	04-0	00-3	64	63-8	04-5	124	123-7	08-6	184	183-5	12-8	244	243-4	170
5	05-0	00-3	65	64-8	04-5	125	124-7	08-7	185	184-5	12-9	245	244-4	171
6	06-0	00-4	66	65-8	04-6	126	125-7	08-8	186	185-5	13-0	246	245-4	172
7	07-0	00-5	67	66-8	04-7	127	126-7	08-9	187	186-5	13-0	247	246-4	173
8	08-0	00-6	68	67-8	04-7	128	127-7	08-9	188	187-5	13-1	248	247-4	173
9	09-0	00-6	69	68-8	04-8	129	128-7	09-0	189	188-5	13-2	249	248-4	174
10	10-0	00-7	70	69-8	04-9	130	129-7	09-1	190	189-5	13-3	250	249-4	174
11	11-0	00-8	71	70-8	05-0	131	130-7	09-1	191	190-5	13-3	251	250-4	175
12	12-0	00-8	72	71-8	05-0	132	131-7	09-2	192	191-5	13-4	252	251-4	176
13	13-0	00-9	73	72-8	05-1	133	132-7	09-3	193	192-5	13-5	253	252-4	176
14	14-0	01-0	74	73-8	05-2	134	133-7	09-3	194	193-5	13-5	254	253-4	177
15	15-0	01-0	75	74-8	05-2	135	134-7	09-4	195	194-5	13-6	255	254-4	178
16	16-0	01-1	76	75-8	05-3	136	135-7	09-5	196	195-5	13-7	256	255-4	179
17	17-0	01-2	77	76-8	05-4	137	136-7	09-6	197	196-5	13-7	257	256-4	179
18	18-0	01-3	78	77-8	05-4	138	137-7	09-6	198	197-5	13-8	258	257-4	180
19	19-0	01-3	79	78-8	05-5	139	138-7	09-7	199	198-5	13-9	259	258-4	181
20	20-0	01-4	80	79-8	05-6	140	139-7	09-8	200	199-5	14-0	260	259-4	181
21	20-9	01-5	81	80-8	05-7	141	140-7	09-8	201	200-5	14-0	261	260-4	182
22	21-9	01-5	82	81-8	05-7	142	141-7	09-9	202	201-5	14-1	262	261-4	183
23	22-9	01-6	83	82-8	05-8	143	142-7	10-0	203	202-5	14-2	263	262-4	183
24	23-9	01-7	84	83-8	05-9	144	143-6	10-0	204	203-5	14-2	264	263-4	184
25	24-9	01-7	85	84-8	05-9	145	144-6	10-1	205	204-5	14-3	265	264-4	185
26	25-9	01-8	86	85-8	06-0	146	145-6	10-2	206	205-5	14-4	266	265-4	186
27	26-9	01-9	87	86-8	06-1	147	146-6	10-3	207	206-5	14-4	267	266-4	186
28	27-9	02-0	88	87-8	06-1	148	147-6	10-3	208	207-5	14-5	268	267-4	187
29	28-9	02-0	89	88-8	06-2	149	148-6	10-4	209	208-5	14-6	269	268-4	188
30	29-9	02-1	90	89-8	06-3	150	149-6	10-5	210	209-5	14-6	270	269-4	188
31	30-9	02-2	91	90-8	06-3	151	150-6	10-5	211	210-5	14-7	271	270-4	189
32	31-9	02-2	92	91-8	06-4	152	151-6	10-6	212	211-5	14-8	272	271-4	190
33	32-9	02-3	93	92-8	06-5	153	152-6	10-7	213	212-5	14-9	273	272-4	190
34	33-9	02-4	94	93-8	06-6	154	153-6	10-7	214	213-5	14-9	274	273-4	191
35	34-9	02-4	95	94-8	06-6	155	154-6	10-8	215	214-5	15-0	275	274-4	192
36	35-9	02-5	96	95-8	06-7	156	155-6	10-9	216	215-5	15-1	276	275-4	193
37	36-9	02-6	97	96-8	06-8	157	156-6	11-0	217	216-5	15-1	277	276-4	193
38	37-9	02-7	98	97-8	06-8	158	157-6	11-0	218	217-5	15-2	278	277-4	194
39	38-9	02-7	99	98-8	06-9	159	158-6	11-1	219	218-5	15-3	279	278-4	195
40	39-9	02-8	100	99-8	07-0	160	159-6	11-2	220	219-5	15-3	280	279-4	195
41	40-9	02-9	101	100-8	07-0	161	160-6	11-2	221	220-5	15-4	281	280-4	196
42	41-9	02-9	102	101-8	07-1	162	161-6	11-3	222	221-5	15-5	282	281-4	197
43	42-9	03-0	103	102-7	07-2	163	162-6	11-4	223	222-5	15-6	283	282-4	197
44	43-9	03-1	104	103-7	07-3	164	163-6	11-4	224	223-5	15-6	284	283-4	198
45	44-9	03-1	105	104-7	07-3	165	164-6	11-5	225	224-5	15-7	285	284-4	199
46	45-9	03-2	106	105-7	07-4	166	165-6	11-6	226	225-4	15-8	286	285-4	200
47	46-9	03-3	107	106-7	07-5	167	166-6	11-6	227	226-4	15-8	287	286-4	200
48	47-9	03-3	108	107-7	07-5	168	167-6	11-7	228	227-4	15-9	288	287-4	201
49	48-9	03-4	109	108-7	07-6	169	168-6	11-8	229	228-4	16-0	289	288-4	202
50	49-9	03-5	110	109-7	07-7	170	169-6	11-9	230	229-4	16-0	290	289-4	202
51	50-9	03-6	111	110-7	07-7	171	170-6	11-9	231	230-4	16-1	291	290-4	203
52	51-9	03-6	112	111-7	07-8	172	171-6	12-0	232	231-4	16-2	292	291-4	204
53	52-9	03-7	113	112-7	07-9	173	172-6	12-1	233	232-4	16-3	293	292-4	204
54	53-9	03-8	114	113-7	08-0	174	173-6	12-1	234	233-4	16-3	294	293-4	205
55	54-9	03-8	115	114-7	08-0	175	174-6	12-2	235	234-4	16-4	295	294-4	205
56	55-9	03-9	116	115-7	08-1	176	175-6	12-3	236	235-4	16-5	296	295-4	206
57	56-9	04-0	117	116-7	08-2	177	176-6	12-3	237	236-4	16-5	297	296-4	207
58	57-9	04-0	118	117-7	08-2	178	177-6	12-4	238	237-4	16-6	298	297-4	208
59	58-9	04-1	119	118-7	08-3	179	178-6	12-5	239	238-4	16-7	299	298-4	209
60	59-9	04-2	120	119-7	08-4	180	179-6	12-6	240	239-4	16-7	300	299-4	209

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 86 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 5 DEGREES.

45

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-8	05-3	121	120-5	10-5	181	180-3	15-8	241	240-1	21-0
2	02-0	00-2	62	61-8	05-4	122	121-5	10-6	182	181-3	15-9	242	241-1	21-1
3	03-0	00-3	63	62-8	05-5	123	122-5	10-7	183	182-3	15-9	243	242-1	21-2
4	04-0	00-4	64	63-8	05-6	124	123-5	10-8	184	183-3	16-0	244	243-1	21-3
5	05-0	00-5	65	64-8	05-7	125	124-5	10-9	185	184-3	16-1	245	244-1	21-4
6	06-0	00-6	66	65-7	05-8	126	125-5	11-0	186	185-3	16-2	246	245-1	21-4
7	07-0	00-7	67	66-7	05-8	127	126-5	11-1	187	186-3	16-3	247	246-1	21-5
8	08-0	00-7	68	67-7	05-9	128	127-5	11-2	188	187-3	16-4	248	247-1	21-6
9	09-0	00-8	69	68-7	06-0	129	128-5	11-2	189	188-3	16-5	249	248-1	21-7
10	10-0	00-9	70	69-7	06-1	130	129-5	11-3	190	189-3	16-6	250	249-0	21-7
11	11-0	01-0	71	70-7	06-2	131	130-5	11-4	191	190-3	16-6	251	250-0	21-9
12	12-0	01-0	72	71-7	06-3	132	131-5	11-5	192	191-3	16-7	252	251-0	22-0
13	13-0	01-1	73	72-7	06-4	133	132-5	11-6	193	192-3	16-8	253	252-0	22-1
14	14-0	01-2	74	73-7	06-4	134	133-5	11-7	194	193-3	16-9	254	253-0	22-1
15	15-0	01-3	75	74-7	06-5	135	134-5	11-8	195	194-3	17-0	255	254-0	22-2
16	16-0	01-4	76	75-7	06-6	136	135-5	11-9	196	195-3	17-1	256	255-0	22-3
17	17-0	01-5	77	76-7	06-7	137	136-5	11-9	197	196-3	17-2	257	256-0	22-4
18	18-0	01-6	78	77-7	06-8	138	137-5	12-0	198	197-2	17-3	258	257-0	22-5
19	19-0	01-7	79	78-7	06-9	139	138-5	12-1	199	198-2	17-3	259	258-0	22-6
20	19-9	01-7	80	79-7	07-0	140	139-5	12-2	200	199-2	17-4	260	259-0	22-7
21	20-9	01-8	81	80-7	07-1	141	140-5	12-3	201	200-2	17-5	261	260-0	22-7
22	21-9	01-9	82	81-7	07-1	142	141-5	12-4	202	201-2	17-6	262	261-0	22-8
23	22-9	02-0	83	82-7	07-2	143	142-5	12-5	203	202-2	17-7	263	262-0	22-9
24	23-9	02-1	84	83-7	07-3	144	143-5	12-6	204	203-2	17-8	264	263-0	23-0
25	24-9	02-2	85	84-7	07-4	145	144-4	12-6	205	204-2	17-9	265	264-0	23-1
26	25-9	02-3	86	85-7	07-5	146	145-4	12-7	206	205-2	18-0	266	265-0	23-2
27	26-9	02-4	87	86-7	07-6	147	146-4	12-8	207	206-2	18-0	267	266-0	23-3
28	27-9	02-4	88	87-7	07-7	148	147-4	12-9	208	207-2	18-1	268	267-0	23-4
29	28-9	02-5	89	88-7	07-8	149	148-4	13-0	209	208-2	18-2	269	268-0	23-4
30	29-9	02-6	90	89-7	07-8	150	149-4	13-1	210	209-2	18-3	270	269-0	23-5
31	30-9	02-7	91	90-7	07-9	151	150-4	13-2	211	210-2	18-4	271	270-0	23-6
32	31-9	02-8	92	91-6	08-0	152	151-4	13-2	212	211-2	18-5	272	271-0	23-7
33	32-9	02-9	93	92-6	08-1	153	152-4	13-3	213	212-2	18-6	273	272-0	23-8
34	33-9	03-0	94	93-6	08-2	154	153-4	13-4	214	213-2	18-7	274	273-0	23-9
35	34-9	03-1	95	94-6	08-3	155	154-4	13-5	215	214-2	18-7	275	274-0	24-0
36	35-9	03-1	96	95-6	08-4	156	155-4	13-6	216	215-2	18-8	276	274-9	24-1
37	36-9	03-2	97	96-6	08-5	157	156-4	13-7	217	216-2	18-9	277	275-9	24-1
38	37-9	03-3	98	97-6	08-5	158	157-4	13-8	218	217-2	19-0	278	276-9	24-2
39	38-9	03-4	99	98-6	08-6	159	158-4	13-9	219	218-2	19-1	279	277-9	24-3
40	39-8	03-5	100	99-6	08-7	160	159-4	13-9	220	219-2	19-2	280	278-9	24-4
41	40-8	03-6	101	100-6	08-8	161	160-4	14-0	221	220-2	19-3	281	279-9	24-5
42	41-8	03-7	102	101-6	08-9	162	161-4	14-1	222	221-2	19-3	282	280-9	24-6
43	42-8	03-7	103	102-6	09-0	163	162-4	14-2	223	222-2	19-4	283	281-9	24-7
44	43-8	03-8	104	103-6	09-1	164	163-4	14-3	224	223-1	19-5	284	282-9	24-8
45	44-8	03-9	105	104-6	09-2	165	164-4	14-4	225	224-1	19-6	285	283-9	24-8
46	45-8	04-0	106	105-6	09-2	166	165-4	14-5	226	225-1	19-7	286	284-9	24-9
47	46-8	04-1	107	106-6	09-3	167	166-4	14-6	227	226-1	19-8	287	285-9	25-0
48	47-8	04-2	108	107-6	09-4	168	167-4	14-6	228	227-1	19-9	288	286-9	25-1
49	48-8	04-3	109	108-6	09-5	169	168-4	14-7	229	228-1	20-0	289	287-9	25-2
50	49-8	04-4	110	109-6	09-6	170	169-4	14-8	230	229-1	20-0	290	288-9	25-3
51	50-8	04-4	111	110-6	09-7	171	170-3	14-9	231	230-1	20-1	291	289-9	25-4
52	51-8	04-6	112	111-6	09-8	172	171-3	15-0	232	231-1	20-2	292	290-9	25-4
53	52-8	04-6	113	112-6	09-8	173	172-3	15-1	233	232-1	20-3	293	291-9	25-5
54	53-8	04-7	114	113-6	09-9	174	173-3	15-2	234	233-1	20-4	294	292-9	25-6
55	54-8	04-8	115	114-6	10-0	175	174-3	15-3	235	234-1	20-5	295	293-9	25-7
56	55-8	04-9	116	115-6	10-1	176	175-3	15-3	236	235-1	20-6	296	294-9	25-8
57	56-8	05-0	117	116-6	10-2	177	176-3	15-4	237	236-1	20-7	297	295-9	25-9
58	57-8	05-1	118	117-6	10-3	178	177-3	15-5	238	237-1	20-7	298	296-9	26-0
59	58-8	05-1	119	118-5	10-4	179	178-3	15-6	239	238-1	20-8	299	297-9	26-1
60	59-8	05-2	120	119-5	10-5	180	179-3	15-7	240	239-1	20-9	300	298-9	26-1

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 5 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-7	06-4	121	120-3	12-6	181	180-0	18-9	241	239-7	25-2
2	02-0	00-2	62	61-7	06-5	122	121-3	12-8	182	181-0	19-0	242	240-7	25-3
3	03-0	00-3	63	62-7	06-6	123	122-3	12-9	183	182-0	19-1	243	241-7	25-4
4	04-0	00-4	64	63-6	06-7	124	123-3	13-0	184	183-0	19-2	244	242-7	25-5
5	05-0	00-5	65	64-6	06-8	125	124-3	13-1	185	184-0	19-3	245	243-7	25-6
6	06-0	00-6	66	65-6	06-9	126	125-3	13-2	186	185-0	19-4	246	244-7	25-7
7	07-0	00-7	67	66-6	07-0	127	126-3	13-3	187	186-0	19-5	247	245-6	25-8
8	08-0	00-8	68	67-6	07-1	128	127-3	13-4	188	187-0	19-6	248	246-6	25-9
9	09-0	00-9	69	68-6	07-2	129	128-3	13-5	189	188-0	19-7	249	247-6	26-0
10	09-9	01-0	70	69-6	07-3	130	129-3	13-6	190	189-0	19-8	250	248-6	26-1
11	10-9	01-1	71	70-6	07-4	131	130-3	13-7	191	190-0	20-0	251	249-6	26-2
12	11-9	01-3	72	71-6	07-5	132	131-3	13-8	192	190-9	20-1	252	250-6	26-3
13	12-9	01-4	73	72-6	07-6	133	132-3	13-9	193	191-9	20-2	253	251-6	26-4
14	13-9	01-5	74	73-6	07-7	134	133-3	14-0	194	192-9	20-3	254	252-6	26-5
15	14-9	01-6	75	74-6	07-8	135	134-3	14-1	195	193-9	20-4	255	253-6	26-6
16	15-9	01-7	76	75-6	07-9	136	135-3	14-2	196	194-9	20-5	256	254-6	26-7
17	16-9	01-8	77	76-6	08-0	137	136-3	14-3	197	195-9	20-6	257	255-6	26-8
18	17-9	01-9	78	77-6	08-1	138	137-3	14-4	198	196-9	20-7	258	256-6	26-9
19	18-9	02-0	79	78-6	08-2	139	138-3	14-5	199	197-9	20-8	259	257-6	27-0
20	19-9	02-1	80	79-6	08-3	140	139-3	14-6	200	198-9	20-9	260	258-6	27-1
21	20-9	02-2	81	80-6	08-5	141	140-2	14-7	201	199-9	21-0	261	259-6	27-2
22	21-9	02-3	82	81-6	08-6	142	141-2	14-8	202	200-9	21-1	262	260-6	27-3
23	22-9	02-4	83	82-6	08-7	143	142-2	14-9	203	201-9	21-2	263	261-6	27-4
24	23-9	02-5	84	83-6	08-8	144	143-2	15-0	204	202-9	21-3	264	262-6	27-5
25	24-9	02-6	85	84-6	08-9	145	144-2	15-1	205	203-9	21-4	265	263-6	27-6
26	25-9	02-7	86	85-6	09-0	146	145-2	15-2	206	204-9	21-5	266	264-6	27-7
27	26-9	02-8	87	86-6	09-1	147	146-2	15-3	207	205-9	21-6	267	265-6	27-8
28	27-9	02-9	88	87-6	09-2	148	147-2	15-4	208	206-9	21-7	268	266-6	27-9
29	28-9	03-0	89	88-6	09-3	149	148-2	15-5	209	207-9	21-8	269	267-6	28-0
30	29-9	03-1	90	89-6	09-4	150	149-2	15-6	210	208-9	21-9	270	268-6	28-1
31	30-8	03-2	91	90-5	09-5	151	150-2	15-8	211	209-8	22-1	271	269-5	28-2
32	31-8	03-3	92	91-5	09-6	152	151-2	15-9	212	210-8	22-2	272	270-5	28-3
33	32-8	03-4	93	92-5	09-7	153	152-2	16-0	213	211-8	22-3	273	271-5	28-4
34	33-8	03-5	94	93-5	09-8	154	153-2	16-1	214	212-8	22-4	274	272-5	28-5
35	34-8	03-6	95	94-5	09-9	155	154-2	16-2	215	213-8	22-5	275	273-5	28-6
36	35-8	03-7	96	95-5	10-0	156	155-2	16-3	216	214-8	22-6	276	274-5	28-7
37	36-8	03-8	97	96-5	10-1	157	156-2	16-4	217	215-8	22-7	277	275-5	28-8
38	37-8	04-0	98	97-5	10-2	158	157-2	16-5	218	216-8	22-8	278	276-5	28-9
39	38-8	04-1	99	98-5	10-3	159	158-2	16-6	219	217-8	22-9	279	277-5	29-0
40	39-8	04-2	100	99-5	10-5	160	159-2	16-7	220	218-8	23-0	280	278-5	29-1
41	40-8	04-3	101	100-4	10-6	161	160-1	16-8	221	219-8	23-1	281	279-5	29-2
42	41-8	04-4	102	101-4	10-7	162	161-1	16-9	222	220-8	23-2	282	280-5	29-3
43	42-8	04-5	103	102-4	10-8	163	162-1	17-0	223	221-8	23-3	283	281-4	29-4
44	43-8	04-6	104	103-4	10-9	164	163-1	17-1	224	222-8	23-4	284	282-4	29-5
45	44-8	04-7	105	104-4	11-0	165	164-1	17-2	225	223-8	23-5	285	283-4	29-6
46	45-7	04-8	106	105-4	11-1	166	165-1	17-3	226	224-8	23-6	286	284-4	29-7
47	46-7	04-9	107	106-4	11-2	167	166-1	17-4	227	225-8	23-7	287	285-4	29-8
48	47-7	05-0	108	107-4	11-3	168	167-1	17-5	228	226-8	23-8	288	286-4	29-9
49	48-7	05-1	109	108-4	11-4	169	168-1	17-6	229	227-7	23-9	289	287-4	30-0
50	49-7	05-2	110	109-4	11-5	170	169-1	17-8	230	228-7	24-0	290	288-4	30-1
51	50-7	05-3	111	110-4	11-6	171	170-1	17-9	231	229-7	24-1	291	289-4	30-2
52	51-7	05-4	112	111-4	11-7	172	171-1	18-0	232	230-7	24-2	292	290-4	30-3
53	52-7	05-5	113	112-4	11-8	173	172-1	18-1	233	231-7	24-3	293	291-4	30-4
54	53-7	05-6	114	113-4	11-9	174	173-0	18-2	234	232-7	24-4	294	292-4	30-5
55	54-7	05-7	115	114-4	12-0	175	174-0	18-3	235	233-7	24-5	295	293-4	30-6
56	55-7	05-8	116	115-4	12-1	176	175-0	18-4	236	234-7	24-6	296	294-4	30-7
57	56-7	06-0	117	116-4	12-2	177	176-0	18-5	237	235-7	24-8	297	295-4	30-8
58	57-7	06-1	118	117-4	12-3	178	177-0	18-6	238	236-7	24-9	298	296-4	30-9
59	58-7	06-2	119	118-3	12-4	179	178-0	18-7	239	237-7	25-0	299	297-4	31-0
60	59-7	06-3	120	119-3	12-5	180	179-0	18-8	240	238-7	25-1	300	298-4	31-1

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 84 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 7 DEGREES.

47

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01°00'01"	61	60°5	07°4	121	120°1	14°7	181	179°7	22°1	241	239°2	29°4	
2	02°00'02"	62	61°5	07°6	122	121°1	14°9	182	180°6	22°2	242	240°2	29°5	
3	03°00'04"	63	62°5	07°7	123	122°1	15°0	183	181°6	22°3	243	241°2	29°6	
4	04°00'05"	64	63°5	07°8	124	123°1	15°1	184	182°6	22°4	244	242°2	29°7	
5	05°00'06"	65	64°5	07°9	125	124°1	15°2	185	183°6	22°5	245	243°2	29°9	
6	06°00'07"	66	65°5	08°0	126	125°1	15°4	186	184°6	22°7	246	244°2	30°0	
7	06°59'09"	67	66°5	08°2	127	126°1	15°5	187	185°6	22°8	247	245°2	30°1	
8	07°59'10"	68	67°5	08°3	128	127°0	15°6	188	186°6	22°9	248	246°2	30°2	
9	08°59'11"	69	68°5	08°4	129	128°0	15°7	189	187°6	23°0	249	247°1	30°3	
10	09°59'12"	70	69°5	08°5	130	129°0	15°8	190	188°6	23°2	250	248°1	30°5	
11	10°59'01°3	71	70°5	08°7	131	130°0	16°0	191	189°6	23°3	251	249°1	30°6	
12	11°59'01°5	72	71°5	08°8	132	131°0	16°1	192	190°6	23°4	252	250°1	30°7	
13	12°59'01°6	73	72°5	08°9	133	132°0	16°2	193	191°6	23°5	253	251°1	30°8	
14	13°59'01°7	74	73°4	09°0	134	133°0	16°3	194	192°6	23°6	254	252°1	31°0	
15	14°59'01°8	75	74°4	09°1	135	134°0	16°5	195	193°5	23°8	255	253°1	31°1	
16	15°59'01°9	76	75°4	09°3	136	135°0	16°6	196	194°5	23°9	256	254°1	31°2	
17	16°59'02°1	77	76°4	09°4	137	136°0	16°7	197	195°5	24°0	257	255°1	31°3	
18	17°59'02°2	78	77°4	09°5	138	137°0	16°8	198	196°5	24°1	258	256°1	31°4	
19	18°59'02°3	79	78°4	09°6	139	138°0	16°9	199	197°5	24°3	259	257°1	31°6	
20	19°59'02°4	80	79°4	09°7	140	139°0	17°1	200	198°5	24°4	260	258°1	31°7	
21	20°58'02°6	81	80°4	09°9	141	139°9	17°2	201	199°5	24°5	261	259°1	31°8	
22	21°58'02°7	82	81°4	10°0	142	140°9	17°3	202	200°5	24°6	262	260°0	31°9	
23	22°58'02°8	83	82°4	10°1	143	141°9	17°4	203	201°5	24°7	263	261°0	32°1	
24	23°58'02°9	84	83°4	10°2	144	142°9	17°5	204	202°5	24°9	264	262°0	32°2	
25	24°58'03°0	85	84°4	10°4	145	143°9	17°7	205	203°5	25°0	265	263°0	32°3	
26	25°58'03°2	86	85°4	10°5	146	144°9	17°8	206	204°5	25°1	266	264°0	32°4	
27	26°58'03°3	87	86°4	10°6	147	145°9	17°9	207	205°5	25°2	267	265°0	32°5	
28	27°58'03°4	88	87°3	10°7	148	146°9	18°0	208	206°4	25°3	268	266°0	32°7	
29	28°58'03°5	89	88°3	10°8	149	147°9	18°2	209	207°4	25°5	269	267°0	32°8	
30	29°58'03°7	90	89°3	11°0	150	148°9	18°3	210	208°4	25°6	270	268°0	32°9	
31	30°58'03°8	91	90°3	11°1	151	149°9	18°4	211	209°4	25°7	271	269°0	33°0	
32	31°58'03°9	92	91°3	11°2	152	150°9	18°5	212	210°4	25°8	272	270°0	33°1	
33	32°58'04°0	93	92°3	11°3	153	151°9	18°6	213	211°4	25°9	273	271°0	33°3	
34	33°57'04°1	94	93°3	11°5	154	152°9	18°8	214	212°4	26°1	274	272°0	33°4	
35	34°57'04°3	95	94°3	11°6	155	153°8	18°9	215	213°4	26°2	275	273°0	33°5	
36	35°57'04°4	96	95°3	11°7	156	154°8	19°0	216	214°4	26°3	276	273°9	33°6	
37	36°57'04°5	97	96°3	11°8	157	155°8	19°1	217	215°4	26°4	277	274°9	33°8	
38	37°57'04°6	98	97°3	11°9	158	156°8	19°3	218	216°4	26°6	278	275°9	33°9	
39	38°57'04°8	99	98°3	12°1	159	157°8	19°4	219	217°4	26°7	279	276°9	34°0	
40	39°57'04°9	100	99°3	12°2	160	158°8	19°5	220	218°4	26°8	280	277°9	34°1	
41	40°57'05°0	101	100°2	12°3	161	159°8	19°6	221	219°4	26°9	281	278°9	34°2	
42	41°57'05°1	102	101°2	12°4	162	160°8	19°7	222	220°3	27°1	282	279°9	34°4	
43	42°57'05°2	103	102°2	12°6	163	161°8	19°9	223	221°3	27°2	283	280°9	34°5	
44	43°57'05°4	104	103°2	12°7	164	162°8	20°0	224	222°3	27°3	284	281°9	34°6	
45	44°57'05°5	105	104°2	12°8	165	163°8	20°1	225	223°3	27°4	285	282°9	34°7	
46	45°57'05°6	106	105°2	12°9	166	164°8	20°2	226	224°3	27°5	286	283°9	34°9	
47	46°57'05°7	107	106°2	13°0	167	165°8	20°4	227	225°3	27°7	287	284°9	35°0	
48	47°57'05°8	108	107°2	13°2	168	166°7	20°5	228	226°3	27°8	288	285°9	35°1	
49	48°57'05°9	109	108°2	13°3	169	167°7	20°6	229	227°3	27°9	289	286°8	35°2	
50	49°57'06°1	110	109°2	13°4	170	168°7	20°7	230	228°3	28°0	290	287°8	35°3	
51	50°56'06°2	111	110°2	13°5	171	169°7	20°8	231	229°3	28°2	291	288°8	35°5	
52	51°56'06°3	112	111°2	13°6	172	170°7	21°0	232	230°3	28°3	292	289°8	35°6	
53	52°56'06°5	113	112°2	13°8	173	171°7	21°1	233	231°3	28°4	293	290°8	35°7	
54	53°56'06°6	114	113°2	13°9	174	172°7	21°2	234	232°3	28°5	294	291°8	35°8	
55	54°56'06°7	115	114°1	14°0	175	173°7	21°3	235	233°2	28°6	295	292°8	36°0	
56	55°56'06°8	116	115°1	14°1	176	174°7	21°4	236	234°2	28°8	296	293°8	36°1	
57	56°56'06°9	117	116°1	14°3	177	175°7	21°6	237	235°2	28°9	297	294°8	36°2	
58	57°56'07°1	118	117°1	14°4	178	176°7	21°7	238	236°2	29°0	298	295°8	36°3	
59	58°56'07°2	119	118°1	14°5	179	177°7	21°8	239	237°2	29°1	299	296°8	36°4	
60	59°56'07°3	120	119°1	14°6	180	178°7	21°9	240	238°2	29°2	300	297°8	36°6	
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 83 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00.1	61	60.4	08.5	121	119.8	18.8	181	179.2	25.2	241	238.7	32.5
2	02-0	00.3	62	61.4	08.6	122	120.8	17.0	182	180.2	25.3	242	239.6	32.7
3	03-0	00.4	63	62.4	08.8	123	121.8	17.1	183	181.4	25.5	243	240.6	32.8
4	04-0	00.6	64	63.4	08.9	124	122.8	17.3	184	182.2	25.6	244	241.6	32.9
5	05-0	00.7	65	64.4	09.0	125	123.8	17.4	185	183.2	25.7	245	242.6	32.9
6	05-9	00.8	66	65.4	09.2	126	124.8	17.5	186	184.2	25.9	246	243.6	32.9
7	06-9	01.0	67	66.3	09.3	127	125.8	17.7	187	185.2	26.0	247	244.6	32.9
8	07-9	01.1	68	67.3	09.5	128	126.8	17.8	188	186.2	26.2	248	245.6	32.9
9	08-9	01.3	69	68.3	09.6	129	127.7	18.0	189	187.2	26.3	249	246.6	32.9
10	09-9	01.4	70	69.3	09.7	130	128.7	18.1	190	188.2	26.4	250	247.6	32.9
11	10-9	01.5	71	70.3	09.9	131	129.7	18.2	191	189.1	26.6	251	248.6	32.9
12	11-9	01.7	72	71.3	10.0	132	130.7	18.4	192	190.1	26.7	252	249.5	32.9
13	12-9	01.8	73	72.3	10.2	133	131.7	18.5	193	191.1	26.9	253	250.5	32.9
14	13-9	01.9	74	73.3	10.3	134	132.7	18.6	194	192.1	27.0	254	251.5	32.9
15	14-8	02.1	75	74.3	10.4	135	133.7	18.8	195	193.1	27.1	255	252.5	32.9
16	15-8	02.2	76	75.3	10.6	136	134.7	18.9	196	194.1	27.3	256	253.5	32.9
17	16-8	02.4	77	76.3	10.7	137	135.7	19.1	197	195.1	27.4	257	254.5	32.9
18	17-8	02.5	78	77.2	10.9	138	136.7	19.2	198	196.1	27.6	258	255.5	32.9
19	18-8	02.6	79	78.2	11.0	139	137.7	19.3	199	197.1	27.7	259	256.5	32.9
20	19-8	02.8	80	79.2	11.1	140	138.6	19.5	200	198.1	27.8	260	257.5	32.9
21	20-8	02.9	81	80.2	11.3	141	139.6	19.6	201	199.0	28.0	261	258.5	32.9
22	21-8	03.1	82	81.2	11.4	142	140.6	19.8	202	200.0	28.1	262	259.5	32.9
23	22-8	03.2	83	82.2	11.6	143	141.6	19.9	203	201.0	28.3	263	260.4	32.9
24	23-8	03.3	84	83.2	11.7	144	142.6	20.0	204	202.0	28.4	264	261.4	32.9
25	24-8	03.5	85	84.2	11.8	145	143.6	20.2	205	203.0	28.5	265	262.4	32.9
26	25-7	03.6	86	85.2	12.0	146	144.6	20.3	206	204.0	28.7	266	263.4	32.9
27	26-7	03.8	87	86.2	12.1	147	145.6	20.5	207	205.0	28.8	267	264.4	32.9
28	27-7	03.9	88	87.1	12.2	148	146.6	20.6	208	206.0	28.9	268	265.4	32.9
29	28-7	04.0	89	88.1	12.4	149	147.5	20.7	209	207.0	29.1	269	266.4	32.9
30	29-7	04.2	90	89.1	12.5	150	148.5	20.9	210	208.0	29.2	270	267.4	32.9
31	30-7	04.3	91	90.1	12.7	151	149.5	21.0	211	208.9	29.4	271	268.4	32.9
32	31-7	04.5	92	91.1	12.8	152	150.5	21.2	212	209.9	29.5	272	269.4	32.9
33	32-7	04.6	93	92.1	12.9	153	151.5	21.3	213	210.9	29.6	273	270.4	32.9
34	33-7	04.7	94	93.1	13.1	154	152.5	21.4	214	211.9	29.8	274	271.3	32.9
35	34-7	04.9	95	94.1	13.2	155	153.5	21.6	215	212.9	29.9	275	272.3	32.9
36	35-6	05.0	96	95.1	13.4	156	154.5	21.7	216	213.9	30.1	276	273.3	32.9
37	36-6	05.1	97	96.1	13.5	157	155.5	21.9	217	214.9	30.2	277	274.3	32.9
38	37-6	05.3	98	97.0	13.6	158	156.5	22.0	218	215.9	30.3	278	275.3	32.9
39	38-6	05.4	99	98.0	13.8	159	157.5	22.1	219	216.9	30.5	279	276.3	32.9
40	39-6	05.6	100	99.0	13.9	160	158.4	22.3	220	217.9	30.6	280	277.3	32.9
41	40-6	05.7	101	100.0	14.1	161	159.4	22.4	221	218.8	30.8	281	278.3	32.9
42	41-6	05.8	102	101.0	14.2	162	160.4	22.5	222	219.8	30.8	282	279.3	32.9
43	42-6	06.0	103	102.0	14.3	163	161.4	22.7	223	220.8	31.0	283	280.2	32.9
44	43-6	06.1	104	103.0	14.5	164	162.4	22.8	224	221.8	31.2	284	281.2	32.9
45	44-6	06.3	105	104.0	14.6	165	163.4	23.0	225	222.8	31.3	285	282.2	32.9
46	45-6	06.4	106	105.0	14.8	166	164.4	23.1	226	223.8	31.5	286	283.2	32.9
47	46-5	06.5	107	106.0	14.9	167	165.4	23.2	227	224.8	31.6	287	284.2	32.9
48	47-5	06.7	108	106.9	15.0	168	166.4	23.4	228	225.8	31.7	288	285.2	32.9
49	48-5	06.8	109	107.9	15.2	169	167.4	23.5	229	226.8	31.9	289	286.2	32.9
50	49-5	07.0	110	108.9	15.3	170	168.3	23.7	230	227.6	32.0	290	287.2	32.9
51	50-5	07.1	111	109.9	15.4	171	169.3	23.8	231	228.8	32.1	291	288.2	32.9
52	51-5	07.2	112	110.9	15.6	172	170.3	23.9	232	229.7	32.3	292	289.2	32.9
53	52-5	07.4	113	111.9	15.7	173	171.3	24.1	233	230.7	32.4	293	290.1	32.9
54	53-5	07.5	114	112.9	15.9	174	172.3	24.2	234	231.7	32.6	294	291.1	32.9
55	54-5	07.7	115	113.9	16.0	175	173.3	24.4	235	232.7	32.7	295	292.1	32.9
56	55-5	07.8	116	114.9	16.1	176	174.3	24.5	236	233.7	32.8	296	293.1	32.9
57	56-4	07.9	117	115.9	16.3	177	175.3	24.6	237	234.7	33.0	297	294.1	32.9
58	57-4	08.1	118	116.9	16.4	178	176.3	24.8	238	235.7	33.1	298	295.1	32.9
59	58-4	08.2	119	117.8	16.6	179	177.3	24.9	239	236.7	33.3	299	296.1	32.9
60	59-4	08.4	120	118.8	16.7	180	178.2	25.1	240	237.7	33.4	300	297.1	32.9
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 82 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 9 DEGREES.

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Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-2	61	60-2	09-5	121	119-5	18-9	181	178-8	28-3	241	238-0	37-7
2	02-0	00-3	62	61-2	09-7	122	120-5	19-1	182	179-8	28-5	242	239-0	37-9
3	03-0	00-5	63	62-2	09-9	123	121-5	19-2	183	18-7	28-6	243	240-0	38-0
4	04-0	00-6	64	63-2	10-0	124	122-5	19-4	184	181-7	28-8	244	241-0	38-2
5	04-9	00-8	65	64-2	10-2	125	123-5	19-6	185	182-7	28-9	245	242-0	38-3
6	05-9	00-9	66	65-2	10-3	126	124-4	19-7	186	183-7	29-1	246	243-0	38-5
7	06-9	01-1	67	66-2	10-5	127	125-4	19-9	187	184-7	29-3	247	244-0	38-6
8	07-9	01-3	68	67-2	10-6	128	126-4	20-0	188	185-7	29-4	248	244-9	38-8
9	08-9	01-4	69	68-2	10-8	129	127-4	20-2	189	186-7	29-6	249	245-9	39-0
10	09-9	01-6	70	69-1	11-0	130	128-4	20-3	190	187-7	29-7	250	246-9	39-1
11	10-9	01-7	71	70-1	11-1	131	129-4	20-5	191	188-6	29-9	251	247-9	39-3
12	11-9	01-9	72	71-1	11-3	132	130-4	20-6	192	189-6	30-0	252	248-9	39-4
13	12-8	02-0	73	72-1	11-4	133	131-4	20-8	193	190-6	30-2	253	249-9	39-6
14	13-8	02-2	74	73-1	11-6	134	132-4	21-0	194	191-6	30-3	254	250-9	39-7
15	14-8	02-3	75	74-1	11-7	135	133-3	21-1	195	192-6	30-5	255	251-9	39-9
16	15-8	02-5	76	75-1	11-9	136	134-3	21-3	196	193-6	30-7	256	252-8	40-0
17	16-8	02-7	77	76-1	12-0	137	135-3	21-4	197	194-6	30-8	257	253-8	40-2
18	17-8	02-8	78	77-0	12-2	138	136-3	21-6	198	195-6	31-0	258	254-8	40-4
19	18-8	03-0	79	78-0	12-4	139	137-3	21-7	199	196-5	31-1	259	2-8	40-5
20	19-8	03-1	80	79-0	12-5	140	138-3	21-9	200	197-5	31-3	260	2-8	40-7
21	20-7	03-3	81	80-0	12-7	141	139-3	22-1	201	198-5	31-4	261	257-8	40-8
22	21-7	03-4	82	81-0	12-8	142	140-3	22-2	202	199-5	31-6	262	258-8	41-0
23	22-7	03-6	83	82-0	13-0	143	141-2	22-4	203	200-5	31-8	263	259-8	41-1
24	23-7	03-8	84	83-0	13-1	144	142-2	22-5	204	201-5	31-9	264	260-7	41-3
25	24-7	03-9	85	84-0	13-3	145	143-2	22-7	205	202-5	32-1	265	261-7	41-5
26	25-7	04-1	86	84-9	13-5	146	144-2	22-8	206	203-5	32-2	266	262-7	41-6
27	26-7	04-2	87	85-9	13-6	147	145-2	23-0	207	204-5	32-4	267	263-7	41-8
28	27-7	04-4	88	86-9	13-8	148	146-2	23-2	208	205-4	32-5	268	264-7	41-9
29	28-6	04-5	89	87-9	13-9	149	147-2	23-3	209	206-4	32-7	269	265-7	42-1
30	29-6	04-7	90	88-9	14-1	150	148-2	23-5	210	207-4	32-9	270	266-7	42-2
31	30-6	04-8	91	89-9	14-2	151	149-1	23-6	211	208-4	33-0	271	267-7	42-4
32	31-6	05-0	92	90-9	14-4	152	150-1	23-8	212	209-4	33-2	272	268-7	42-6
33	32-6	05-2	93	91-9	14-5	153	151-1	23-9	213	210-4	33-3	273	269-7	42-7
34	33-6	05-3	94	92-8	14-7	154	152-1	24-1	214	211-4	33-5	274	270-6	42-9
35	34-6	05-5	95	93-8	14-9	155	153-1	24-2	215	212-4	33-6	275	271-6	43-0
36	35-6	05-6	96	94-8	15-0	156	154-1	24-4	216	213-3	33-8	276	272-6	43-2
37	36-5	05-8	97	95-8	15-2	157	155-1	24-6	217	214-3	33-9	277	273-6	43-3
38	37-5	05-9	98	96-8	15-3	158	156-1	24-7	218	215-3	34-1	278	274-6	43-5
39	38-5	06-1	99	97-8	15-5	159	157-0	24-9	219	216-3	34-3	279	275-6	43-6
40	39-5	06-3	100	98-8	15-6	160	158-0	25-0	220	217-3	34-4	280	276-6	43-8
41	40-5	06-4	101	99-8	15-8	161	159-0	25-2	221	218-3	34-6	281	277-5	44-0
42	41-5	06-6	102	100-7	16-0	162	160-0	25-3	222	219-3	34-7	282	278-5	44-1
43	42-5	06-7	103	101-7	16-1	163	161-0	25-5	223	220-3	34-9	283	279-5	44-3
44	43-5	06-9	104	102-7	16-3	164	162-0	25-7	224	221-2	35-0	284	280-5	44-4
45	44-4	07-0	105	103-7	16-4	165	163-0	25-8	225	222-2	35-2	285	281-5	44-6
46	45-4	07-2	106	104-7	16-6	166	164-0	26-0	226	223-2	35-4	286	282-5	44-7
47	46-4	07-4	107	105-7	16-7	167	164-9	26-1	227	224-2	35-5	287	283-5	44-9
48	47-4	07-5	108	106-7	16-9	168	165-9	26-3	228	225-2	35-7	288	284-5	45-1
49	48-4	07-7	109	107-7	17-1	169	166-9	26-4	229	226-2	35-8	289	285-4	45-2
50	49-4	07-8	110	108-6	17-2	170	167-9	26-6	230	227-2	36-0	290	286-4	45-4
51	50-4	08-0	111	109-6	17-4	171	168-9	26-8	231	228-2	36-1	291	287-4	45-5
52	51-4	08-1	112	110-6	17-5	172	169-9	26-9	232	229-1	36-3	292	288-4	45-7
53	52-3	08-3	113	111-6	17-7	173	170-9	27-1	233	230-1	36-4	293	289-4	45-8
54	53-3	08-4	114	112-6	17-8	174	171-9	27-2	234	231-1	36-6	294	290-4	46-0
55	54-3	08-6	115	113-6	18-0	175	172-8	27-4	235	232-1	36-8	295	291-4	46-1
56	55-3	08-8	116	114-6	18-1	176	173-8	27-5	236	233-1	36-9	296	292-4	46-3
57	56-3	08-9	117	115-6	18-3	177	174-8	27-7	237	234-1	37-1	297	293-4	46-5
58	57-3	09-1	118	116-5	18-5	178	175-8	27-8	238	235-1	37-2	298	294-3	46-6
59	58-3	09-2	119	117-5	18-6	179	176-8	28-0	239	236-1	37-4	299	295-3	46-8
60	59-3	09-4	120	118-5	18-8	180	177-8	28-2	240	237-0	37-5	300	296-3	46-9

Dep. Lat. Dist.

Dep. Lat. Dist.

Dep. Lat. Dist.

Dep. Lat. Dist.

Dep. Lat. Dist.

Dep. Lat.

FOR 81 DEGREES.

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Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-1	61	60-4	08-5	121	119-8	16-8	181	179-2	25-2	241	238-7	33-6
2	02-0	00-3	62	61-4	08-6	122	120-8	17-0	182	180-2	25-3	242	239-6	33-7
3	03-0	00-4	63	62-4	08-8	123	121-8	17-1	183	181-2	25-5	243	240-6	33-8
4	04-0	00-6	64	63-4	08-9	124	122-8	17-3	184	182-2	25-6	244	241-6	33-9
5	05-0	00-7	65	64-4	09-0	125	123-8	17-4	185	183-2	25-7	245	242-6	34-0
6	06-0	00-8	66	65-4	09-2	126	124-8	17-5	186	184-2	25-9	246	243-6	34-1
7	06-9	01-0	67	66-3	09-3	127	125-8	17-7	187	185-2	26-0	247	244-6	34-2
8	07-9	01-1	68	67-3	09-5	128	126-8	17-8	188	186-2	26-2	248	245-6	34-3
9	08-9	01-3	69	68-3	09-6	129	127-7	18-0	189	187-2	26-3	249	246-6	34-4
10	09-9	01-4	70	69-3	09-7	130	128-7	18-1	190	188-2	26-4	250	247-6	34-5
11	10-9	01-5	71	70-3	09-9	131	129-7	18-2	191	189-1	26-6	251	248-6	34-6
12	11-9	01-7	72	71-3	10-0	132	130-7	18-4	192	190-1	26-7	252	249-6	34-7
13	12-9	01-8	73	72-3	10-2	133	131-7	18-5	193	191-1	26-9	253	250-6	34-8
14	13-9	01-9	74	73-3	10-3	134	132-7	18-6	194	192-1	27-0	254	251-6	34-9
15	14-8	02-1	75	74-3	10-4	135	133-7	18-8	195	193-1	27-1	255	252-6	35-0
16	15-8	02-2	76	75-3	10-6	136	134-7	18-9	196	194-1	27-3	256	253-6	35-1
17	16-8	02-4	77	76-3	10-7	137	135-7	19-1	197	195-1	27-4	257	254-6	35-2
18	17-8	02-5	78	77-2	10-9	138	136-7	19-2	198	196-1	27-6	258	255-6	35-3
19	18-8	02-6	79	78-2	11-0	139	137-7	19-3	199	197-1	27-7	259	256-6	35-4
20	19-8	02-8	80	79-2	11-1	140	138-6	19-5	200	198-1	27-8	260	257-6	35-5
21	20-8	02-9	81	80-2	11-3	141	139-6	19-6	201	199-0	28-0	261	258-6	35-6
22	21-8	03-1	82	81-2	11-4	142	140-6	19-8	202	200-0	28-1	262	259-6	35-7
23	22-8	03-2	83	82-2	11-6	143	141-6	19-9	203	201-0	28-3	263	260-6	35-8
24	23-8	03-3	84	83-2	11-7	144	142-6	20-0	204	202-0	28-4	264	261-6	35-9
25	24-8	03-5	85	84-2	11-8	145	143-6	20-2	205	203-0	28-5	265	262-6	36-0
26	25-7	03-6	86	85-2	12-0	146	144-6	20-3	206	204-0	28-7	266	263-6	36-1
27	26-7	03-8	87	86-2	12-1	147	145-6	20-5	207	205-0	28-8	267	264-6	36-2
28	27-7	03-9	88	87-1	12-2	148	146-6	20-6	208	206-0	28-9	268	265-6	36-3
29	28-7	04-0	89	88-1	12-4	149	147-5	20-7	209	207-0	29-1	269	266-6	36-4
30	29-7	04-2	90	89-1	12-5	150	148-5	20-9	210	208-0	29-2	270	267-6	36-5
31	30-7	04-3	91	90-1	12-7	151	149-5	21-0	211	208-9	29-4	271	268-6	36-6
32	31-7	04-5	92	91-1	12-8	152	150-5	21-2	212	209-9	29-5	272	269-6	36-7
33	32-7	04-6	93	92-1	12-9	153	151-5	21-3	213	210-9	29-6	273	270-6	36-8
34	33-7	04-7	94	93-1	13-1	154	152-5	21-4	214	211-9	29-8	274	271-6	36-9
35	34-7	04-9	95	94-1	13-2	155	153-5	21-6	215	212-9	29-9	275	272-6	37-0
36	35-6	05-0	96	95-1	13-4	156	154-5	21-7	216	213-9	30-1	276	273-6	37-1
37	36-6	05-1	97	96-1	13-5	157	155-5	21-9	217	214-9	30-2	277	274-6	37-2
38	37-6	05-3	98	97-0	13-6	158	156-5	22-0	218	215-9	30-3	278	275-6	37-3
39	38-6	05-4	99	98-0	13-8	159	157-5	22-1	219	216-9	30-5	279	276-6	37-4
40	39-6	05-6	100	99-0	13-9	160	158-4	22-3	220	217-9	30-6	280	277-6	37-5
41	40-6	05-7	101	100-0	14-1	161	159-4	22-4	221	218-8	30-8	281	278-6	37-6
42	41-6	05-8	102	101-0	14-2	162	160-4	22-5	222	219-8	30-9	282	279-6	37-7
43	42-6	06-0	103	102-0	14-3	163	161-4	22-7	223	220-8	31-0	283	280-6	37-8
44	43-6	06-1	104	103-0	14-5	164	162-4	22-8	224	221-8	31-2	284	281-6	37-9
45	44-6	06-3	105	104-0	14-6	165	163-4	23-0	225	222-8	31-3	285	282-6	38-0
46	45-6	06-4	106	105-0	14-8	166	164-4	23-1	226	223-8	31-5	286	283-6	38-1
47	46-5	06-5	107	106-0	14-9	167	165-4	23-2	227	224-8	31-6	287	284-6	38-2
48	47-5	06-7	108	106-9	15-0	168	166-4	23-4	228	225-8	31-7	288	285-6	38-3
49	48-5	06-8	109	107-9	15-2	169	167-4	23-5	229	226-8	31-9	289	286-6	38-4
50	49-5	07-0	110	108-9	15-3	170	168-3	23-7	230	227-8	32-0	290	287-6	38-5
51	50-5	07-1	111	109-9	15-4	171	169-3	23-8	231	228-8	32-1	291	288-6	38-6
52	51-5	07-2	112	110-9	15-6	172	170-3	23-9	232	229-7	32-3	292	289-6	38-7
53	52-5	07-4	113	111-9	15-7	173	171-3	24-1	233	230-7	32-4	293	290-6	38-8
54	53-5	07-5	114	112-9	15-9	174	172-3	24-2	234	231-7	32-6	294	291-6	38-9
55	54-5	07-7	115	113-9	16-0	175	173-3	24-4	235	232-7	32-7	295	292-6	39-0
56	55-5	07-8	116	114-9	16-1	176	174-3	24-5	236	233-7	32-8	296	293-6	39-1
57	56-4	07-9	117	115-9	16-3	177	175-3	24-6	237	234-7	33-0	297	294-6	39-2
58	57-4	08-1	118	116-9	16-4	178	176-3	24-8	238	235-7	33-1	298	295-6	39-3
59	58-4	08-2	119	117-8	16-6	179	177-3	24-9	239	236-7	33-3	299	296-6	39-4
60	59-4	08-4	120	118-8	16-7	180	178-2	25-1	240	237-7	33-4	300	297-6	39-5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 9 DEGREES.

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Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-2	61	60-2	09-5	121	119-5	18-9	181	178-8	28-3	241	238-0	37-7
2	02-0	00-3	62	61-2	09-7	122	120-5	19-1	182	179-8	28-5	242	239-0	37-9
3	03-0	00-5	63	62-2	09-9	123	121-5	19-2	183	18-7	28-6	243	240-0	38-0
4	04-0	00-6	64	63-2	10-0	124	122-5	19-4	184	181-7	28-8	244	241-0	38-2
5	04-9	00-8	65	64-2	10-2	125	123-5	19-6	185	182-7	28-9	245	242-0	38-3
6	05-9	00-9	66	65-2	10-3	126	124-4	19-7	186	183-7	29-1	246	243-0	38-5
7	06-9	01-1	67	66-2	10-5	127	125-4	19-9	187	184-7	29-3	247	244-0	38-6
8	07-9	01-3	68	67-2	10-6	128	126-4	20-0	188	185-7	29-4	248	244-9	38-8
9	08-9	01-4	69	68-2	10-8	129	127-4	20-2	189	186-7	29-6	249	245-9	39-0
10	09-9	01-6	70	69-1	11-0	130	128-4	20-3	190	187-7	29-7	250	246-9	39-1
11	10-9	01-7	71	70-1	11-1	131	129-4	20-5	191	188-6	29-9	251	247-9	39-3
12	11-9	01-9	72	71-1	11-3	132	130-4	20-6	192	189-6	30-0	252	248-9	39-4
13	12-8	02-0	73	72-1	11-4	133	131-4	20-8	193	190-6	30-2	253	249-9	39-6
14	13-8	02-2	74	73-1	11-6	134	132-4	21-0	194	191-6	30-3	254	250-9	39-7
15	14-8	02-5	75	74-1	11-7	135	133-3	21-1	195	192-6	30-5	255	251-9	39-9
16	15-8	02-5	76	75-1	11-9	136	134-3	21-3	196	193-6	30-7	256	252-8	40-0
17	16-8	02-7	77	76-1	12-0	137	135-3	21-4	197	194-6	30-8	257	253-8	40-2
18	17-8	02-8	78	77-0	12-2	138	136-3	21-6	198	195-6	31-0	258	254-8	40-4
19	18-8	03-0	79	78-0	12-4	139	137-3	21-7	199	196-5	31-1	259	2-8	40-5
20	19-8	03-1	80	79-0	12-5	140	138-3	21-9	200	197-5	31-3	260	2-8	40-7
21	20-7	03-3	81	80-0	12-7	141	139-3	22-1	201	198-5	31-4	261	257-8	40-8
22	21-7	03-4	82	81-0	12-8	142	140-3	22-2	202	199-5	31-6	262	258-8	41-0
23	22-7	03-6	83	82-0	13-0	143	141-2	22-4	203	200-5	31-8	263	259-8	41-1
24	23-7	03-8	84	83-0	13-1	144	142-2	22-5	204	201-5	31-9	264	260-7	41-3
25	24-7	03-9	85	84-0	13-3	145	143-2	22-7	205	202-5	32-1	265	261-7	41-5
26	25-7	04-1	86	84-9	13-5	146	144-2	22-8	206	203-5	32-2	266	262-7	41-6
27	26-7	04-2	87	85-9	13-6	147	145-2	23-0	207	204-5	32-4	267	263-7	41-8
28	27-7	04-4	88	86-9	13-8	148	146-2	23-2	208	205-4	32-5	268	264-7	41-9
29	28-6	04-5	89	87-9	13-9	149	147-2	23-3	209	206-4	32-7	269	265-7	42-1
30	29-6	04-7	90	88-9	14-1	150	148-2	23-5	210	207-4	32-9	270	266-7	42-2
31	30-6	04-8	91	89-9	14-2	151	149-1	23-6	211	208-4	33-0	271	267-7	42-4
32	31-6	05-0	92	90-9	14-4	152	150-1	23-8	212	209-4	33-2	272	268-7	42-6
33	32-6	05-2	93	91-9	14-5	153	151-1	23-9	213	210-4	33-3	273	269-7	42-7
34	33-6	05-3	94	92-8	14-7	154	152-1	24-1	214	211-4	33-5	274	270-6	42-9
35	34-6	05-5	95	93-8	14-9	155	153-1	24-2	215	212-4	33-6	275	271-6	43-0
36	35-6	05-6	96	94-8	15-0	156	154-1	24-4	216	213-3	33-8	276	272-6	43-2
37	36-5	05-8	97	95-8	15-2	157	155-1	24-6	217	214-3	33-9	277	273-6	43-3
38	37-5	05-9	98	96-8	15-3	158	156-1	24-7	218	215-3	34-1	278	274-6	43-5
39	38-5	06-1	99	97-8	15-5	159	157-0	24-9	219	216-3	34-3	279	275-6	43-6
40	39-5	06-3	100	98-8	15-6	160	158-0	25-0	220	217-3	34-4	280	276-6	43-8
41	40-5	06-4	101	99-8	15-8	161	159-0	25-2	221	218-3	34-6	281	277-5	44-0
42	41-5	06-6	102	100-7	16-0	162	160-0	25-3	222	219-3	34-7	282	278-5	44-1
43	42-5	06-7	103	101-7	16-1	163	161-0	25-5	223	220-3	34-9	283	279-5	44-3
44	43-5	06-9	104	102-7	16-3	164	162-0	25-7	224	221-2	35-0	284	280-5	44-4
45	44-4	07-0	105	103-7	16-4	165	163-0	25-8	225	222-2	35-2	285	281-5	44-6
46	45-4	07-2	106	104-7	16-6	166	164-0	26-0	226	223-2	35-4	286	282-5	44-7
47	46-4	07-4	107	105-7	16-7	167	165-0	26-1	227	224-2	35-5	287	283-5	44-9
48	47-4	07-5	108	106-7	16-9	168	166-9	26-3	228	225-2	35-7	288	284-5	45-1
49	48-4	07-7	109	107-7	17-1	169	167-9	26-4	229	226-2	35-8	289	285-4	45-2
50	49-4	07-8	110	108-6	17-2	170	167-9	26-6	230	227-2	36-0	290	286-4	45-4
51	50-4	08-0	111	109-6	17-4	171	168-9	26-8	231	228-2	36-1	291	287-4	45-5
52	51-4	08-1	112	110-6	17-5	172	169-9	26-9	232	229-1	36-3	292	288-4	45-7
53	52-3	08-3	113	111-6	17-7	173	170-9	27-1	233	230-1	36-4	293	289-4	45-8
54	53-3	08-4	114	112-6	17-8	174	171-9	27-2	234	231-1	36-6	294	290-4	46-0
55	54-3	08-6	115	113-6	18-0	175	172-8	27-4	235	232-1	36-8	295	291-4	46-1
56	55-3	08-8	116	114-6	18-1	176	173-8	27-5	236	233-1	36-9	296	292-4	46-3
57	56-3	08-9	117	115-6	18-3	177	174-8	27-7	237	234-1	37-1	297	293-4	46-5
58	57-3	09-1	118	116-5	18-5	178	175-8	27-8	238	235-1	37-2	298	294-3	46-6
59	58-3	09-2	119	117-5	18-6	179	176-8	28-0	239	236-1	37-4	299	295-3	46-8
60	59-3	09-4	120	118-5	18-8	180	177-8	28-2	240	237-0	37-5	300	296-3	46-9

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14	138	02-4	74	72-9	12-8	134	132-0	23-3	194	191-0	33-7	254
15	148	02-6	75	73-9	13-0	135	132-3	23-4	195	192-0	33-9	255
16	158	02-8	76	74-8	13-2	136	133-0	23-6	196	193-0	34-0	256
17	167	03-0	77	75-8	13-4	137	134-3	23-8	197	194-0	34-2	257
18	177	03-1	78	76-8	13-5	138	135-9	24-0	198	195-0	34-4	258
19	187	03-3	79	77-8	13-7	139	136-9	24-1	199	196-0	34-6	259
20	197	03-5	80	78-8	13-9	140	137-9	24-3	200	197-0	34-7	260
21	207	03-6	81	79-8	14-1	141	138-9	24-5	201	197-9	34-9	261
22	217	03-8	82	80-8	14-2	142	139-8	24-7	202	198-9	35-1	262
23	227	04-0	83	81-7	14-4	143	140-8	24-8	203	199-9	35-3	263
24	236	04-2	84	82-7	14-6	144	141-8	25-0	204	200-9	35-4	264
25	246	04-3	85	83-7	14-8	145	142-8	25-2	205	201-9	35-6	265
26	256	04-5	86	84-7	14-9	146	143-8	25-4	206	202-9	35-8	266
27	266	04-7	87	85-7	15-1	147	144-8	25-5	207	203-9	35-9	267
28	276	04-9	88	86-7	15-3	148	145-8	25-7	208	204-8	36-1	268
29	286	05-0	89	87-6	15-5	149	146-7	25-9	209	205-8	36-3	269
30	29-5	05-2	90	88-6	15-6	150	147-7	26-0	210	206-8	36-5	270
31	30-5	05-4	91	89-6	15-8	151	148-7	26-2	211	207-8	36-6	271
32	31-5	05-6	92	90-6	16-0	152	149-7	26-4	212	208-8	36-8	272
33	32-5	05-7	93	91-6	16-1	153	150-7	26-6	213	209-8	37-0	273
34	33-5	05-9	94	92-6	16-3	154	151-7	26-7	214	210-7	37-2	274
35	34-5	06-1	95	93-6	16-5	155	152-6	26-9	215	211-7	37-3	275
36	35-5	06-3	96	94-5	16-7	156	153-6	27-1	216	212-7	37-5	276
37	36-4	06-4	97	95-5	16-8	157	154-6	27-3	217	213-7	37-7	277
38	37-4	06-6	98	96-5	17-0	158	155-6	27-4	218	214-7	37-9	278
39	38-4	06-8	99	97-5	17-2	159	156-6	27-6	219	215-7	38-0	279
40	39-4	06-9	100	98-5	17-4	160	157-6	27-8	220	216-7	38-2	280
41	40-4	07-1	101	99-5	17-5	161	158-6	28-0	221	217-6	38-4	281
42	41-4	07-3	102	100-5	17-7	162	159-5	28-1	222	218-6	38-5	282
43	42-3	07-5	103	101-4	17-9	163	160-5	28-3	223	219-6	38-7	283
44	43-3	07-6	104	102-4	18-1	164	161-5	28-5	224	220-6	38-9	284
45	44-3	07-8	105	103-4	18-2	165	162-5	28-7	225	221-6	39-1	285
46	45-3	08-0	106	104-4	18-4	166	163-5	28-8	226	222-6	39-2	286

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 11 DEGREES. 51

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01°0'	00.2	61	59°9'	11.6	121	118°8'	23.1	181	177°7'	34.5	241	236°8'	46.0			
2	02°0'	00.4	62	60°9'	11.8	122	119°8'	23.3	182	178°7'	34.7	242	237°6'	46.2			
3	03°0'	00.6	63	61°8'	12.0	123	120°7'	23.5	183	179°6'	34.9	243	238°5'	46.4			
4	03°0'	00.8	64	62°8'	12.2	124	121°7'	23.7	184	180°6'	35.1	244	239°5'	46.6			
5	04°0'	01.0	65	63°8'	12.4	125	122°7'	23.9	185	181°6'	35.3	245	240°5'	46.7			
6	05°0'	01.1	66	64°8'	12.6	126	123°7'	24.0	186	182°6'	35.5	246	241°5'	46.9			
7	06°0'	01.3	67	65°8'	12.8	127	124°7'	24.2	187	183°6'	35.7	247	242°5'	47.1			
8	07°0'	01.5	68	66°8'	13.0	128	125°6'	24.4	188	184°5'	35.9	248	243°4'	47.3			
9	08°0'	01.7	69	67°7'	13.2	129	126°6'	24.6	189	185°5'	36.1	249	244°4'	47.5			
10	09°0'	01.9	70	68°7'	13.4	130	127°6'	24.8	190	186°5'	36.3	250	245°4'	47.7			
11	10°8'	02.1	71	69°7'	13.5	131	128°6'	25.0	191	187°5'	36.4	251	246°4'	47.9			
12	11°8'	02.3	72	70°7'	13.7	132	129°6'	25.2	192	188°5'	36.6	252	247°4'	48.1			
13	12°8'	02.5	73	71°7'	13.9	133	130°6'	25.4	193	189°5'	36.8	253	248°4'	48.3			
14	13°7'	02.7	74	72°6'	14.1	134	131°5'	25.6	194	190°4'	37.0	254	249°3'	48.5			
15	14°7'	02.9	75	73°6'	14.3	135	132°5'	25.8	195	191°4'	37.2	255	250°3'	48.7			
16	15°7'	03.1	76	74°6'	14.5	136	133°5'	26.0	196	192°4'	37.4	256	251°3'	48.8			
17	16°7'	03.2	77	75°6'	14.7	137	134°5'	26.1	197	193°4'	37.6	257	252°3'	49.0			
18	17°7'	03.4	78	76°6'	14.9	138	135°5'	26.3	198	194°4'	37.8	258	253°3'	49.2			
19	18°7'	03.6	79	77°5'	15.1	139	136°4'	26.5	199	195°3'	38.0	259	254°2'	49.4			
20	19°6'	03.8	80	78°5'	15.3	140	137°4'	26.7	200	196°3'	38.2	260	255°2'	49.6			
21	20°6'	04.0	81	79°5'	15.5	141	138°4'	26.9	201	197°3'	38.4	261	256°2'	49.8			
22	21°6'	04.2	82	80°5'	15.6	142	139°4'	27.1	202	198°3'	38.5	262	257°2'	50.0			
23	22°6'	04.4	83	81°5'	15.8	143	140°4'	27.3	203	199°3'	38.7	263	258°2'	50.2			
24	23°6'	04.6	84	82°5'	16.0	144	141°4'	27.5	204	200°3'	38.9	264	259°1'	50.4			
25	24°5'	04.8	85	83°4'	16.2	145	142°3'	27.7	205	201°2'	39.1	265	260°1'	50.6			
26	25°5'	05.0	86	84°4'	16.4	146	143°3'	27.9	206	202°2'	39.3	266	261°1'	50.8			
27	26°5'	05.2	87	85°4'	16.6	147	144°3'	28.0	207	203°2'	39.5	267	262°1'	50.9			
28	27°5'	05.3	88	86°4'	16.8	148	145°3'	28.2	208	204°2'	39.7	268	263°1'	51.1			
29	28°5'	05.5	89	87°4'	17.0	149	146°3'	28.4	209	205°2'	39.9	269	264°1'	51.3			
30	29°4'	05.7	90	88°3'	17.2	150	147°2'	28.6	210	206°1'	40.1	270	265°0'	51.5			
31	30°4'	05.9	91	89°3'	17.4	151	148°2'	28.8	211	207°1'	40.3	271	266°0'	51.7			
32	31°4'	06.1	92	90°3'	17.6	152	149°2'	29.0	212	208°1'	40.5	272	267°0'	51.9			
33	32°4'	06.3	93	91°3'	17.7	153	150°2'	29.2	213	209°1'	40.6	273	268°0'	52.1			
34	33°4'	06.5	94	92°3'	17.9	154	151°2'	29.4	214	210°1'	40.8	274	269°0'	52.3			
35	34°4'	06.7	95	93°3'	18.1	155	152°2'	29.6	215	211°0'	41.0	275	269°9'	52.5			
36	35°3'	06.9	96	94°2'	18.3	156	153°1'	29.8	216	212°0'	41.2	276	270°9'	52.7			
37	36°3'	07.1	97	95°2'	18.5	157	154°1'	30.0	217	213°0'	41.4	277	271°9'	52.9			
38	37°3'	07.3	98	96°2'	18.7	158	155°1'	30.1	218	214°0'	41.6	278	272°9'	53.0			
39	38°3'	07.4	99	97°2'	18.9	159	156°1'	30.3	219	215°0'	41.8	279	273°9'	53.2			
40	39°3'	07.6	100	98°2'	19.1	160	157°1'	30.5	220	216°0'	42.0	280	274°9'	53.4			
41	40°2'	07.8	101	99°1'	19.3	161	158°0'	30.7	221	216°9'	42.2	281	275°8'	53.6			
42	41°2'	08.0	102	100°1'	19.5	162	159°0'	30.9	222	217°9'	42.4	282	276°8'	53.8			
43	42°2'	08.2	103	101°1'	19.7	163	160°0'	31.1	223	218°9'	42.6	283	277°8'	54.0			
44	43°2'	08.4	104	102°1'	19.8	164	161°0'	31.3	224	219°9'	42.7	284	278°8'	54.2			
45	44°2'	08.6	105	103°1'	20.0	165	162°0'	31.5	225	220°9'	42.9	285	279°8'	54.4			
46	45°2'	08.8	106	104°1'	20.2	166	163°0'	31.7	226	221°8'	43.1	286	280°7'	54.6			
47	46°1'	09.0	107	105°0'	20.4	167	163°9'	31.9	227	222°8'	43.3	287	281°7'	54.8			
48	47°1'	09.2	108	106°0'	20.6	168	164°9'	32.1	228	223°8'	43.5	288	282°7'	55.0			
49	48°1'	09.3	109	107°0'	20.8	169	165°9'	32.2	229	224°8'	43.7	289	283°7'	55.1			
50	49°1'	09.5	110	108°0'	21.0	170	166°9'	32.4	230	225°8'	43.9	290	284°7'	55.3			
51	50°1'	09.7	111	109°0'	21.2	171	167°9'	32.6	231	226°8'	44.1	291	285°7'	55.5			
52	51°0'	09.9	112	109°9'	21.4	172	168°8'	32.8	232	227°7'	44.3	292	286°6'	55.7			
53	52°0'	10.1	113	110°9'	21.6	173	169°8'	33.0	233	228°7'	44.5	293	287°6'	55.9			
54	53°0'	10.3	114	111°9'	21.8	174	170°8'	33.2	234	229°7'	44.6	294	288°6'	56.1			
55	54°0'	10.5	115	112°9'	21.9	175	171°8'	33.4	235	230°7'	44.8	295	289°6'	56.3			
56	55°0'	10.7	116	113°9'	22.1	176	172°8'	33.6	236	231°7'	45.0	296	290°6'	56.5			
57	56°0'	10.9	117	114°9'	22.3	177	173°7'	33.8	237	232°6'	45.2	297	291°5'	56.7			
58	57°9'	11.1	118	115°8'	22.5	178	174°7'	34°0'	238	233°6'	45.4	298	292°5'	56.9			
59	57°9'	11.3	119	116°8'	22.7	179	175°7'	34°2'	239	234°6'	45.6	299	293°5'	57.1			
60	58°9'	11.4	120	117°8'	22.9	180	176°7'	34°3'	240	235°6'	45.8	300	294°5'	57.2			
Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.

FOR 79 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01 0	00 2	61	59 7	12 7	121	118 4	25 2	181	177 0	37 6	241	232 7	591
2	02 0	00 4	62	60 6	12 9	122	119 3	25 4	182	178 0	37 8	242	232 7	592
3	02 9	00 6	63	61 6	13 1	123	120 3	25 6	183	179 0	38 0	243	232 7	593
4	03 9	00 8	64	62 6	13 3	124	121 3	25 8	184	180 0	38 3	244	232 7	594
5	04 9	01 0	65	63 6	13 5	125	122 3	26 0	185	181 0	38 5	245	232 7	595
6	05 9	01 2	66	64 6	13 7	126	123 3	26 2	186	181 9	38 7	246	232 7	596
7	06 8	01 5	67	65 5	13 9	127	124 2	26 4	187	182 9	38 9	247	232 7	597
8	07 8	01 7	68	66 5	14 1	128	125 2	26 6	188	183 9	39 1	248	232 7	598
9	08 8	01 9	69	67 5	14 3	129	126 2	26 8	189	184 9	39 3	249	232 7	599
10	09 8	02 1	70	68 5	14 6	130	127 2	27 0	190	185 8	39 5	250	232 7	600
11	10 8	02 3	71	69 4	14 8	131	128 1	27 2	191	186 8	39 7	251	232 7	601
12	11 7	02 5	72	70 4	15 0	132	129 1	27 4	192	187 8	39 9	252	232 7	602
13	12 7	02 7	73	71 4	15 2	133	130 1	27 7	193	188 8	40 1	253	232 7	603
14	13 7	02 9	74	72 4	15 4	134	131 1	27 9	194	189 8	40 3	254	232 7	604
15	14 7	03 1	75	73 4	15 6	135	132 0	28 1	195	190 7	40 5	255	232 7	605
16	15 7	03 3	76	74 3	15 8	136	133 0	28 3	196	191 7	40 8	256	232 7	606
17	16 6	03 5	77	75 3	16 0	137	134 0	28 5	197	192 7	41 0	257	232 7	607
18	17 6	03 7	78	76 3	16 2	138	135 0	28 7	198	193 7	41 2	258	232 7	608
19	18 6	04 0	79	77 3	16 4	139	136 0	28 9	199	194 7	41 4	259	232 7	609
20	19 6	04 2	80	78 3	16 6	140	136 9	29 1	200	195 6	41 6	260	232 7	610
21	20 5	04 4	81	79 2	16 8	141	137 9	29 3	201	196 6	41 8	261	232 7	611
22	21 5	04 6	82	80 2	17 0	142	138 9	29 5	202	197 6	42 0	262	232 7	612
23	22 5	04 8	83	81 2	17 3	143	139 9	29 7	203	198 6	42 2	263	232 7	613
24	23 5	05 0	84	82 2	17 5	144	140 9	29 9	204	199 5	42 4	264	232 7	614
25	24 5	05 2	85	83 1	17 7	145	141 8	30 1	205	200 5	42 6	265	232 7	615
26	25 4	05 4	86	84 1	17 9	146	142 8	30 4	206	201 5	42 8	266	232 7	616
27	26 4	05 6	87	85 1	18 1	147	143 8	30 6	207	202 5	43 0	267	232 7	617
28	27 4	05 8	88	86 1	18 3	148	144 8	30 8	208	203 5	43 2	268	232 7	618
29	28 4	06 0	89	87 1	18 5	149	145 7	31 0	209	204 4	43 5	269	232 7	619
30	29 3	06 2	90	88 0	18 7	150	146 7	31 2	210	205 4	43 7	270	232 7	620
31	30 3	06 4	91	89 0	18 9	151	147 7	31 4	211	206 4	43 9	271	232 7	621
32	31 3	06 7	92	90 0	19 1	152	148 7	31 6	212	207 4	44 1	272	232 7	622
33	32 3	06 9	93	91 0	19 3	153	149 7	31 8	213	208 3	44 3	273	232 7	623
34	33 3	07 1	94	91 9	19 5	154	150 6	32 0	214	209 3	44 5	274	232 7	624
35	34 2	07 3	95	92 9	19 8	155	151 6	32 2	215	210 3	44 7	275	232 7	625
36	35 2	07 5	96	93 9	20 0	156	152 6	32 4	216	211 3	44 9	276	232 7	626
37	36 2	07 7	97	94 9	20 2	157	153 6	32 6	217	212 3	45 1	277	232 7	627
38	37 2	07 9	98	95 9	20 4	158	154 5	32 9	218	213 2	45 3	278	232 7	628
39	38 1	08 1	99	96 8	20 6	159	155 5	33 1	219	214 2	45 5	279	232 7	629
40	39 1	08 3	100	97 8	20 8	160	156 5	33 3	220	215 2	45 7	280	232 7	630
41	40 1	08 5	101	98 8	21 0	161	157 5	33 5	221	216 2	45 9	281	232 7	631
42	41 1	08 7	102	99 8	21 2	162	158 5	33 7	222	217 1	46 2	282	232 7	632
43	42 1	08 9	103	100 7	21 4	163	159 4	33 9	223	218 1	46 4	283	232 7	633
44	43 0	09 1	104	101 7	21 6	164	160 4	34 1	224	219 1	46 6	284	232 7	634
45	44 0	09 4	105	102 7	21 8	165	161 4	34 3	225	220 1	46 8	285	232 7	635
46	45 0	09 6	106	103 7	22 0	166	162 4	34 5	226	221 1	47 0	286	232 7	636
47	46 0	09 8	107	104 7	22 2	167	163 4	34 7	227	222 0	47 2	287	232 7	637
48	47 0	10 0	108	105 6	22 5	168	164 3	34 9	228	223 0	47 4	288	232 7	638
49	47 9	10 2	109	106 6	22 7	169	165 3	35 1	229	224 0	47 6	289	232 7	639
50	48 9	10 4	110	107 6	22 9	170	166 3	35 3	230	225 0	47 8	290	232 7	640
51	49 9	10 6	111	108 6	23 1	171	167 3	35 6	231	226 0	48 0	291	232 7	641
52	50 9	10 8	112	109 6	23 3	172	168 2	35 8	232	226 9	48 2	292	232 7	642
53	51 8	11 0	113	110 5	23 5	173	169 2	36 0	233	227 9	48 4	293	232 7	643
54	52 8	11 2	114	111 5	23 7	174	170 2	36 2	234	228 9	48 7	294	232 7	644
55	53 8	11 4	115	112 5	23 9	175	171 2	36 4	235	229 9	48 9	295	232 7	645
56	54 8	11 6	116	113 5	24 1	176	172 2	36 6	236	230 8	49 1	296	232 7	646
57	55 8	11 9	117	114 4	24 3	177	173 1	36 8	237	231 8	49 3	297	232 7	647
58	56 7	12 1	118	115 4	24 5	178	174 1	37 0	238	232 8	49 5	298	232 7	648
59	57 7	12 3	119	116 4	24 7	179	175 1	37 2	239	233 8	49 7	299	232 7	649
60	58 7	12 5	120	117 4	24 9	180	176 1	37 4	240	234 8	49 9	300	232 7	650

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 78 DEGREES.

E 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 13 DEGREES. 53

Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.
010	00.2	61	59.4	13.7	121	117.9	27.2	181	176.4	40.7	241	234.6	54.2	
019	00.4	62	60.4	13.9	122	118.9	27.4	182	177.3	40.9	242	235.8	54.4	
029	00.7	63	61.4	14.2	123	119.8	27.7	183	178.3	41.2	243	236.8	54.7	
039	00.9	64	62.4	14.4	124	120.8	27.9	184	179.3	41.4	244	237.7	54.9	
049	01.1	65	63.3	14.6	125	121.8	28.1	185	180.3	41.6	245	238.7	55.1	
058	01.3	66	64.3	14.8	126	122.8	28.3	186	181.2	41.8	246	239.7	55.3	
068	01.6	67	65.3	15.1	127	123.7	28.6	187	182.2	42.1	247	240.7	55.6	
078	01.8	68	66.3	15.3	128	124.7	28.8	188	183.2	42.3	248	241.6	55.6	
088	02.0	69	67.2	15.5	129	125.7	29.0	189	184.2	42.5	249	242.6	56.0	
097	02.2	70	68.2	15.7	130	126.7	29.2	190	185.1	42.7	250	243.6	56.2	
107	02.5	71	69.2	16.0	131	127.6	29.5	191	186.1	43.0	251	244.6	56.5	
117	02.7	72	70.2	16.2	132	128.6	29.7	192	187.1	43.2	252	245.6	56.7	
127	02.9	73	71.1	16.4	133	129.6	29.9	193	188.1	43.4	253	246.5	56.9	
136	03.1	74	72.1	16.6	134	130.6	30.1	194	189.0	43.6	254	247.5	57.1	
146	03.4	75	73.1	16.9	135	131.5	30.4	195	190.0	43.9	255	248.5	57.4	
156	03.6	76	74.1	17.1	136	132.5	30.6	196	191.0	44.1	256	249.4	57.6	
166	03.8	77	75.0	17.3	137	133.5	30.8	197	192.0	44.3	257	250.4	57.8	
175	04.0	78	76.0	17.6	138	134.5	31.0	198	192.9	44.5	258	251.4	58.0	
185	04.3	79	77.0	17.8	139	135.4	31.3	199	193.9	44.8	259	252.4	58.3	
195	04.5	80	77.9	18.0	140	136.4	31.5	200	194.9	45.0	260	253.3	58.5	
205	04.7	81	78.9	18.2	141	137.4	31.7	201	195.8	45.2	261	254.3	58.7	
214	04.9	82	79.9	18.4	142	138.4	31.9	202	196.8	45.4	262	255.3	58.9	
224	05.2	83	80.9	18.7	143	139.3	32.2	203	197.8	45.7	263	256.3	59.2	
234	05.4	84	81.8	18.9	144	140.3	32.4	204	198.8	45.9	264	257.2	59.4	
244	05.6	85	82.8	19.1	145	141.3	32.6	205	199.7	46.1	265	258.2	59.6	
253	05.8	86	83.8	19.3	146	142.3	32.8	206	200.7	46.3	266	259.2	59.8	
263	06.1	87	84.8	19.6	147	143.2	33.1	207	201.7	46.6	267	260.2	60.1	
273	06.3	88	85.7	19.8	148	144.2	33.3	208	202.7	46.8	268	261.1	60.3	
283	06.5	89	86.7	20.0	149	145.2	33.5	209	203.6	47.0	269	262.1	60.5	
292	06.7	90	87.7	20.2	150	146.2	33.7	210	204.6	47.2	270	263.1	60.7	
302	07.0	91	88.7	20.5	151	147.1	34.0	211	205.6	47.5	271	264.1	61.0	
312	07.2	92	89.6	20.7	152	148.1	34.2	212	206.6	47.7	272	265.0	61.2	
322	07.4	93	90.6	20.9	153	149.1	34.4	213	207.5	47.9	273	266.0	61.4	
331	07.6	94	91.6	21.1	154	150.1	34.6	214	208.5	48.1	274	267.0	61.6	
341	07.9	95	92.6	21.4	155	151.0	34.9	215	209.5	48.4	275	268.0	61.9	
351	08.1	96	93.5	21.6	156	152.0	35.1	216	210.5	48.6	276	268.9	62.1	
361	08.3	97	94.5	21.8	157	153.0	35.3	217	211.4	48.8	277	269.9	62.3	
370	08.5	98	95.5	22.0	158	154.0	35.5	218	212.4	49.0	278	270.9	62.5	
380	08.8	99	96.5	22.3	159	154.9	35.8	219	213.4	49.3	279	271.8	62.8	
390	09.0	100	97.4	22.5	160	155.9	36.0	220	214.4	49.5	280	272.8	63.0	
39.9	09.2	101	98.4	22.7	161	156.9	36.2	221	215.3	49.7	281	273.8	63.2	
40.9	09.4	102	99.4	22.9	162	157.8	36.4	222	216.3	49.9	282	274.8	63.4	
41.9	09.7	103	100.4	23.2	163	158.8	36.7	223	217.3	50.2	283	275.7	63.7	
42.9	09.9	104	101.3	23.4	164	159.8	36.9	224	218.3	50.4	284	276.7	63.9	
43.8	10.1	105	102.3	23.6	165	160.8	37.1	225	219.2	50.6	285	277.7	64.1	
44.8	10.3	106	103.3	23.8	166	161.7	37.3	226	220.2	50.8	286	278.7	64.3	
45.8	10.6	107	104.3	24.1	167	162.7	37.6	227	221.2	51.1	287	279.6	64.6	
46.8	10.8	108	105.2	24.3	168	163.7	37.8	228	222.2	51.3	288	280.6	64.8	
47.7	11.0	109	106.2	24.5	169	164.7	38.0	229	223.1	51.5	289	281.6	65.0	
48.7	11.2	110	107.2	24.7	170	165.6	38.2	230	224.1	51.7	290	282.6	65.2	
49.7	11.5	111	108.2	25.0	171	166.6	38.5	231	225.1	52.0	291	283.5	65.5	
50.7	11.7	112	109.1	25.2	172	167.6	38.7	232	226.1	52.2	292	284.5	65.7	
51.6	11.9	113	110.1	25.4	173	168.6	38.9	233	227.0	52.4	293	285.5	65.9	
52.6	12.1	114	111.1	25.6	174	169.5	39.1	234	228.0	52.6	294	286.5	66.1	
53.6	12.4	115	112.1	25.9	175	170.5	39.4	235	229.0	52.9	295	287.4	66.4	
54.6	12.6	116	113.0	26.1	176	171.5	39.6	236	230.0	53.1	296	288.4	66.6	
55.5	12.8	117	114.0	26.3	177	172.5	39.8	237	230.9	53.3	297	289.4	66.8	
56.5	13.0	118	115.0	26.5	178	173.4	40.0	238	231.9	53.5	298	290.4	67.0	
57.5	13.3	119	116.0	26.8	179	174.4	40.3	239	232.9	53.8	299	291.3	67.3	
58.5	13.5	120	116.9	27.0	180	175.4	40.5	240	233.8	54.0	300	292.3	67.5	

Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist.

FOR 77 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-2	61	59-2	14-8	121	117-4	29-3	181	175-6	43-8	241	233-8	58-0
2	01-9	00-5	62	60-2	15-0	122	118-4	29-5	182	176-6	44-0	242	234-8	58-5
3	02-9	00-7	63	61-1	15-2	123	119-3	29-8	183	177-6	44-3	243	235-8	59-0
4	03-9	01-0	64	62-1	15-5	124	120-3	30-0	184	178-6	44-5	244	236-8	59-5
5	04-9	01-2	65	63-1	15-7	125	121-3	30-2	185	179-5	44-8	245	237-7	60-0
6	05-8	01-5	66	64-0	16-0	126	122-3	30-5	186	180-5	45-0	246	238-7	60-5
7	06-8	01-7	67	65-0	16-2	127	123-2	30-7	187	181-4	45-2	247	239-7	61-0
8	07-8	01-9	68	66-0	16-5	128	124-2	31-0	188	182-4	45-5	248	240-6	61-5
9	08-7	02-2	69	67-0	16-7	129	125-2	31-2	189	183-4	45-7	249	241-6	62-0
10	09-7	02-4	70	67-9	16-9	130	126-1	31-4	190	184-4	46-0	250	242-6	62-5
11	10-7	02-7	71	68-9	17-2	131	127-1	31-7	191	185-3	46-2	251	243-5	63-0
12	11-6	02-9	72	69-9	17-4	132	128-1	31-9	192	186-3	46-4	252	244-5	63-5
13	12-6	03-1	73	70-8	17-7	133	129-0	32-2	193	187-3	46-7	253	245-5	64-0
14	13-6	03-4	74	71-8	17-9	134	130-0	32-4	194	188-2	46-9	254	246-5	64-5
15	14-6	03-6	75	72-8	18-1	135	131-0	32-7	195	189-2	47-2	255	247-4	65-0
16	15-5	03-9	76	73-7	18-4	136	132-0	32-9	196	190-2	47-4	256	248-4	65-5
17	16-5	04-1	77	74-7	18-6	137	132-9	33-1	197	191-1	47-7	257	249-4	66-0
18	17-5	04-4	78	75-7	18-9	138	133-9	33-4	198	192-1	47-9	258	250-3	66-5
19	18-4	04-6	79	76-7	19-1	139	134-9	33-6	199	193-1	48-1	259	251-3	67-0
20	19-4	04-8	80	77-6	19-4	140	135-8	33-9	200	194-1	48-4	260	252-3	67-5
21	20-4	05-1	81	78-6	19-6	141	136-8	34-1	201	195-0	48-6	261	253-2	68-0
22	21-3	05-3	82	79-6	19-8	142	137-8	34-4	202	196-0	48-9	262	254-2	68-5
23	22-3	05-6	83	80-5	20-1	143	138-8	34-6	203	197-0	49-1	263	255-2	69-0
24	23-3	05-8	84	81-5	20-3	144	139-7	34-8	204	197-9	49-4	264	256-2	69-5
25	24-3	06-0	85	82-5	20-6	145	140-7	35-1	205	198-9	49-6	265	257-1	70-0
26	25-2	06-3	86	83-4	20-8	146	141-7	35-3	206	199-9	49-8	266	258-1	70-5
27	26-2	06-5	87	84-4	21-0	147	142-6	35-6	207	200-9	50-1	267	259-1	71-0
28	27-2	06-8	88	85-4	21-3	148	143-6	35-8	208	201-8	50-3	268	260-0	71-5
29	28-1	07-0	89	86-4	21-5	149	144-6	36-1	209	202-8	50-6	269	261-0	72-0
30	29-1	07-3	90	87-3	21-8	150	145-5	36-3	210	203-8	50-8	270	262-0	72-5
31	30-1	07-5	91	88-3	22-0	151	146-5	36-5	211	204-7	51-0	271	263-0	73-0
32	31-0	07-7	92	89-3	22-3	152	147-5	36-8	212	205-7	51-3	272	264-0	73-5
33	32-0	08-0	93	90-2	22-5	153	148-5	37-0	213	206-7	51-5	273	265-0	74-0
34	33-0	08-2	94	91-2	22-7	154	149-4	37-3	214	207-6	51-8	274	266-0	74-5
35	34-0	08-5	95	92-2	23-0	155	150-4	37-5	215	208-6	52-0	275	267-0	75-0
36	34-9	08-7	96	93-1	23-2	156	151-4	37-7	216	209-6	52-3	276	268-0	75-5
37	35-9	09-0	97	94-1	23-5	157	152-3	38-0	217	210-6	52-5	277	269-0	76-0
38	36-9	09-2	98	95-1	23-7	158	153-3	38-2	218	211-5	52-7	278	270-0	76-5
39	37-8	09-4	99	96-1	24-0	159	154-3	38-5	219	212-5	53-0	279	271-0	77-0
40	38-8	09-7	100	97-0	24-2	160	155-2	38-7	220	213-5	53-2	280	272-0	77-5
41	39-8	09-9	101	98-0	24-4	161	156-2	38-9	221	214-4	53-5	281	273-0	78-0
42	40-8	10-2	102	99-0	24-7	162	157-2	39-2	222	215-4	53-7	282	274-0	78-5
43	41-7	10-4	103	99-9	24-9	163	158-2	39-4	223	216-4	53-9	283	275-0	79-0
44	42-7	10-6	104	100-9	25-2	164	159-1	39-7	224	217-3	54-2	284	276-0	79-5
45	43-7	10-9	105	101-9	25-4	165	160-1	39-9	225	218-3	54-4	285	277-0	80-0
46	44-6	11-1	106	102-9	25-6	166	161-1	40-2	226	219-3	54-7	286	278-0	80-5
47	45-6	11-4	107	103-8	25-9	167	162-0	40-4	227	220-3	54-9	287	279-0	81-0
48	46-6	11-6	108	104-8	26-1	168	163-0	40-6	228	221-2	55-2	288	280-0	81-5
49	47-5	11-9	109	105-8	26-4	169	164-0	40-9	229	222-2	55-4	289	281-0	82-0
50	48-5	12-1	110	106-7	26-6	170	165-0	41-1	230	223-2	55-6	290	282-0	82-5
51	49-5	12-3	111	107-7	26-9	171	165-9	41-4	231	224-1	55-9	291	283-0	83-0
52	50-5	12-6	112	108-7	27-1	172	166-9	41-6	232	225-1	56-1	292	284-0	83-5
53	51-4	12-8	113	109-6	27-3	173	167-9	41-9	233	226-1	56-4	293	285-0	84-0
54	52-4	13-1	114	110-6	27-6	174	168-8	42-1	234	227-0	56-6	294	286-0	84-5
55	53-4	13-3	115	111-6	27-8	175	169-8	42-3	235	228-0	56-9	295	287-0	85-0
56	54-3	13-5	116	112-6	28-1	176	170-8	42-6	236	229-0	57-1	296	288-0	85-5
57	55-3	13-8	117	113-5	28-3	177	171-7	42-8	237	230-0	57-3	297	289-0	86-0
58	56-3	14-0	118	114-5	28-6	178	172-7	43-1	238	230-9	57-6	298	290-0	86-5
59	57-2	14-3	119	115-5	28-8	179	173-7	43-3	239	231-9	57-8	299	291-0	87-0
60	58-2	14-5	120	116-4	29-0	180	174-7	43-5	240	232-9	58-1	300	292-0	87-5

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

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TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 15 DEGREES. 55

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-3	61	58-9	15-8	121	116-9	31-3	181	174-8	46-8	241	232-8	62-4
2	01-9	00-5	62	59-9	16-0	122	117-8	31-6	182	175-8	47-1	242	233-8	62-6
3	02-9	00-8	63	60-9	16-3	123	118-8	31-8	183	176-8	47-4	243	234-7	62-9
4	03-9	01-0	64	61-8	16-6	124	119-8	32-1	184	177-7	47-6	244	235-7	63-2
5	04-8	01-3	65	62-8	16-8	125	120-7	32-4	185	178-7	47-9	245	236-7	63-4
6	05-8	01-6	66	63-8	17-1	126	121-7	32-6	186	179-7	48-1	246	237-6	63-7
7	06-8	01-8	67	64-7	17-3	127	122-7	32-9	187	180-6	48-4	247	238-6	63-9
8	07-7	02-1	68	65-7	17-6	128	123-6	33-1	188	181-6	48-7	248	239-5	64-2
9	08-7	02-3	69	66-6	17-9	129	124-6	33-4	189	182-6	48-9	249	240-5	64-4
10	09-7	02-6	70	67-6	18-1	130	125-6	33-6	190	183-5	49-2	250	241-5	64-7
11	10-6	02-8	71	68-6	18-4	131	126-5	33-9	191	184-5	49-4	251	242-4	65-0
12	11-6	03-1	72	69-5	18-6	132	127-5	34-2	192	185-5	49-7	252	243-4	65-2
13	12-6	03-4	73	70-5	18-9	133	128-5	34-4	193	186-4	50-0	253	244-4	65-5
14	13-5	03-6	74	71-5	19-2	134	129-4	34-7	194	187-4	50-2	254	245-3	65-7
15	14-5	03-9	75	72-4	19-4	135	130-4	34-9	195	188-4	50-5	255	246-3	66-0
16	15-5	04-1	76	73-4	19-7	136	131-4	35-2	196	189-3	50-7	256	247-3	66-3
17	16-4	04-4	77	74-4	19-9	137	132-3	35-5	197	190-3	51-0	257	248-2	66-5
18	17-4	04-7	78	75-3	20-2	138	133-3	35-7	198	191-3	51-2	258	249-2	66-8
19	18-4	04-9	79	76-3	20-4	139	134-3	36-0	199	192-2	51-5	259	250-2	67-0
20	19-3	05-2	80	77-3	20-7	140	135-2	36-2	200	193-2	51-8	260	251-1	67-3
21	20-3	05-4	81	78-2	21-0	141	136-2	36-5	201	194-2	52-0	261	252-1	67-6
22	21-3	05-7	82	79-2	21-2	142	137-2	36-8	202	195-1	52-3	262	253-1	67-8
23	22-2	06-0	83	80-2	21-5	143	138-1	37-0	203	196-1	52-5	263	254-0	68-1
24	23-2	06-2	84	81-1	21-7	144	139-1	37-3	204	197-0	52-8	264	255-0	68-3
25	24-1	06-5	85	82-1	22-0	145	140-1	37-5	205	198-0	53-1	265	256-0	68-6
26	25-1	06-7	86	83-1	22-3	146	141-0	37-8	206	199-0	53-3	266	256-9	68-8
27	26-1	07-0	87	84-0	22-5	147	142-0	38-0	207	199-9	53-6	267	257-9	69-1
28	27-0	07-2	88	85-0	22-8	148	143-0	38-3	208	200-9	53-8	268	258-9	69-4
29	28-0	07-5	89	86-0	23-0	149	143-9	38-6	209	201-9	54-1	269	259-8	69-6
30	29-0	07-8	90	86-9	23-3	150	144-9	38-8	210	202-8	54-4	270	260-8	69-9
31	29-9	08-0	91	87-9	23-6	151	145-9	39-1	211	203-8	54-6	271	261-8	70-1
32	30-9	08-3	92	88-9	23-8	152	146-8	39-3	212	204-8	54-9	272	262-7	70-4
33	31-9	08-5	93	89-8	24-1	153	147-8	39-6	213	205-7	55-1	273	263-7	70-7
34	32-8	08-8	94	90-8	24-3	154	148-8	39-9	214	206-7	55-4	274	264-7	70-9
35	33-8	09-1	95	91-8	24-6	155	149-7	40-1	215	207-7	55-6	275	265-6	71-2
36	34-8	09-3	96	92-7	24-8	156	150-7	40-4	216	208-6	55-9	276	266-6	71-4
37	35-7	09-6	97	93-7	25-1	157	151-7	40-6	217	209-6	56-2	277	267-6	71-7
38	36-7	09-8	98	94-7	25-4	158	152-6	40-9	218	210-6	56-4	278	268-5	72-0
39	37-7	10-1	99	95-6	25-6	159	153-6	41-2	219	211-5	56-7	279	269-5	72-2
40	38-6	10-4	100	96-6	25-9	160	154-5	41-4	220	212-5	56-9	280	270-5	72-5
41	39-6	10-6	101	97-6	26-1	161	155-5	41-7	221	213-5	57-2	281	271-4	72-7
42	40-6	10-9	102	98-5	26-4	162	156-5	41-9	222	214-4	57-5	282	272-4	73-0
43	41-5	11-1	103	99-5	26-7	163	157-4	42-2	223	215-4	57-7	283	273-4	73-2
44	42-5	11-4	104	100-5	26-9	164	158-4	42-4	224	216-4	58-0	284	274-3	73-5
45	43-5	11-6	105	101-4	27-2	165	159-4	42-7	225	217-3	58-2	285	275-3	73-8
46	44-4	11-9	106	102-4	27-4	166	160-3	43-0	226	218-3	58-5	286	276-3	74-0
47	45-4	12-2	107	103-4	27-7	167	161-3	43-2	227	219-3	58-8	287	277-2	74-3
48	46-4	12-4	108	104-3	28-0	168	162-3	43-5	228	220-2	59-0	288	278-2	74-5
49	47-3	12-7	109	105-3	28-2	169	163-2	43-7	229	221-2	59-3	289	279-2	74-8
50	48-3	12-9	110	106-3	28-5	170	164-2	44-0	230	222-2	59-5	290	280-1	75-1
51	49-3	13-2	111	107-2	28-7	171	165-2	44-3	231	223-1	59-8	291	281-1	75-3
52	50-2	13-5	112	108-2	29-0	172	166-1	44-5	232	224-1	60-0	292	282-1	75-6
53	51-2	13-7	113	109-1	29-2	173	167-1	44-8	233	225-1	60-3	293	283-0	75-8
54	52-2	14-0	114	110-1	29-5	174	168-1	45-0	234	226-0	60-6	294	284-0	76-1
55	53-1	14-2	115	111-1	29-8	175	169-0	45-3	235	227-0	60-8	295	284-9	76-4
56	54-1	14-5	116	112-0	30-0	176	170-0	45-6	236	228-0	61-1	296	285-9	76-6
57	55-1	14-8	117	113-0	30-3	177	171-0	45-8	237	228-9	61-3	297	286-9	76-9
58	56-0	15-0	118	114-0	30-5	178	171-9	46-1	238	229-9	61-6	298	287-8	77-1
59	57-0	15-3	119	114-9	30-8	179	172-9	46-3	239	230-9	61-9	299	288-8	77-4
60	58-0	15-5	120	115-9	31-1	180	173-9	46-6	240	231-8	62-1	300	289-8	77-6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 75 DEGREES.

14	13-5	08-9	74	71-1	20-4	134	128-8	38-9	194	186-5	53-5	254
15	14-4	04-1	75	72-1	20-7	135	129-8	37-2	195	187-4	53-7	255
16	15-4	04-4	76	73-1	20-9	136	130-7	37-5	196	188-4	54-0	256
17	16-3	04-7	77	74-0	21-2	137	131-7	37-8	197	189-4	54-3	257
18	17-3	05-0	78	75-0	21-5	138	132-7	38-0	198	190-3	54-6	258
19	18-3	05-2	79	75-9	21-8	139	133-6	38-3	199	191-3	54-9	259
20	19-2	05-5	80	76-9	22-1	140	134-6	38-6	200	192-3	55-1	260
21	20-2	05-8	81	77-9	22-3	141	135-5	38-9	201	193-2	55-4	261
22	21-1	06-1	82	78-8	22-6	142	136-5	39-1	202	194-2	55-7	262
23	22-1	06-3	83	79-8	22-9	143	137-5	39-4	203	195-1	56-0	263
24	23-1	06-6	84	80-7	23-2	144	138-4	39-7	204	196-1	56-3	264
25	24-0	06-9	85	81-7	23-4	145	139-4	40-0	205	197-1	56-5	265
26	25-0	07-2	86	82-7	23-7	146	140-3	40-2	206	198-0	56-8	266
27	26-0	07-4	87	83-6	24-0	147	141-3	40-5	207	199-0	57-1	267
28	26-9	07-7	88	84-6	24-3	148	142-3	40-8	208	199-9	57-3	268
29	27-9	08-0	89	85-6	24-5	149	143-2	41-1	209	200-9	57-6	269
30	28-8	08-3	90	86-5	24-8	150	144-2	41-3	210	201-9	57-9	270
31	29-8	08-5	91	87-5	25-1	151	145-2	41-6	211	202-8	58-2	271
32	30-8	08-8	92	88-4	25-4	152	146-1	41-9	212	203-8	58-4	272
33	31-7	09-1	93	89-4	25-6	153	147-1	42-2	213	204-7	58-7	273
34	32-7	09-4	94	90-4	25-9	154	148-0	42-4	214	205-7	59-0	274
35	33-6	09-6	95	91-3	26-2	155	149-0	42-7	215	206-7	59-3	275
36	34-6	09-9	96	92-3	26-5	156	150-0	43-0	216	207-6	59-6	276
37	35-6	10-2	97	93-2	26-7	157	150-9	43-3	217	208-6	59-9	277
38	36-5	10-5	98	94-2	27-0	158	151-9	43-6	218	209-6	60-1	278
39	37-5	10-7	99	95-2	27-3	159	152-8	43-9	219	210-5	60-4	279
40	38-5	11-0	100	96-1	27-6	160	153-8	44-1	220	211-5	60-6	280
41	39-4	11-3	101	97-1	27-8	161	154-8	44-4	221	212-4	60-9	281
42	40-4	11-6	102	98-0	28-1	162	155-7	44-7	222	213-4	61-2	282
43	41-3	11-9	103	99-0	28-4	163	156-7	44-9	223	214-4	61-5	283
44	42-3	12-1	104	100-0	28-7	164	157-6	45-2	224	215-3	61-7	284
45	43-3	12-4	105	100-9	28-9	165	158-6	45-5	225	216-3	62-0	285
46	44-2	12-7	106	101-9	29-2	166	159-6	45-8	226	217-2	62-3	286

TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 17 DEGREES.

57

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01-0	00-3	61	58-3	17-8	121	115-7	35-4	181	173-1	52-9	241	230-5	70-5
2	01-9	00-6	62	59-3	18-1	122	116-7	35-7	182	174-0	53-2	242	231-4	70-8
3	02-9	00-9	63	60-2	18-4	123	117-6	36-0	183	175-0	53-5	243	232-4	71-0
4	03-8	01-2	64	61-2	18-7	124	118-6	36-3	184	176-0	53-8	244	233-3	71-3
5	04-8	01-5	65	62-2	19-0	125	119-5	36-5	185	176-9	54-1	245	234-3	71-6
6	05-7	01-8	66	63-1	19-3	126	120-5	36-8	186	177-9	54-4	246	235-3	71-9
7	06-7	02-0	67	64-1	19-6	127	121-5	37-1	187	178-8	54-7	247	236-2	72-2
8	07-7	02-3	68	65-0	19-9	128	122-4	37-4	188	179-8	55-0	248	237-2	72-5
9	08-6	02-6	69	66-0	20-2	129	123-4	37-7	189	180-7	55-3	249	238-1	72-8
10	09-6	02-9	70	66-9	20-5	130	124-3	38-0	190	181-7	55-6	250	239-1	73-1
11	10-5	03-2	71	67-9	20-8	131	125-3	38-3	191	182-7	55-8	251	240-0	73-4
12	11-5	03-5	72	68-9	21-1	132	126-2	38-6	192	183-6	56-1	252	241-0	73-7
13	12-4	03-8	73	69-8	21-3	133	127-2	38-9	193	184-6	56-4	253	241-9	74-0
14	13-4	04-1	74	70-8	21-6	134	128-1	39-2	194	185-5	56-7	254	242-9	74-3
15	14-3	04-4	75	71-7	21-9	135	129-1	39-5	195	186-5	57-0	255	243-9	74-6
16	15-3	04-7	76	72-7	22-2	136	130-1	39-8	196	187-4	57-3	256	244-8	74-8
17	16-3	05-0	77	73-6	22-5	137	131-0	40-1	197	188-4	57-6	257	245-8	75-1
18	17-2	05-3	78	74-6	22-8	138	132-0	40-3	198	189-3	57-9	258	246-7	75-4
19	18-2	05-6	79	75-5	23-1	139	132-9	40-6	199	190-3	58-2	259	247-7	75-7
20	19-1	05-8	80	76-5	23-3	140	133-9	40-9	200	191-3	58-5	260	248-6	76-0
21	20-1	06-1	81	77-5	23-7	141	134-8	41-2	201	192-2	58-8	261	249-6	76-3
22	21-0	06-4	82	78-4	24-0	142	135-8	41-5	202	193-2	59-1	262	250-6	76-6
23	22-0	06-7	83	79-4	24-3	143	136-8	41-8	203	194-1	59-4	263	251-5	76-9
24	23-0	07-0	84	80-3	24-6	144	137-7	42-1	204	195-1	59-6	264	252-5	77-2
25	23-9	07-3	85	81-3	24-9	145	138-7	42-4	205	196-0	59-9	265	253-4	77-5
26	24-9	07-6	86	82-2	25-1	146	139-6	42-7	206	197-0	60-2	266	254-4	77-8
27	25-8	07-9	87	83-2	25-4	147	140-6	43-0	207	198-0	60-5	267	255-3	78-1
28	26-8	08-2	88	84-2	25-7	148	141-5	43-3	208	198-9	60-8	268	256-3	78-4
29	27-7	08-5	89	85-1	26-0	149	142-5	43-6	209	199-9	61-1	269	257-2	78-6
30	28-7	08-8	90	86-1	26-3	150	143-4	43-9	210	200-6	61-4	270	258-2	78-9
31	29-6	09-1	91	87-0	26-6	151	144-4	44-1	211	201-6	61-7	271	259-2	79-2
32	30-6	09-4	92	88-0	26-9	152	145-4	44-4	212	202-7	62-0	272	260-1	79-5
33	31-6	09-6	93	88-9	27-2	153	146-3	44-7	213	203-7	62-3	273	261-1	79-8
34	32-5	09-9	94	89-9	27-5	154	147-3	45-0	214	204-6	62-6	274	262-0	80-1
35	33-5	10-2	95	90-8	27-8	155	148-2	45-3	215	205-6	62-9	275	263-0	80-4
36	34-4	10-5	96	91-8	28-1	156	149-2	45-6	216	206-6	63-2	276	263-9	80-7
37	35-4	10-8	97	92-8	28-4	157	150-1	45-9	217	207-5	63-4	277	264-9	81-0
38	36-3	11-1	98	93-7	28-7	158	151-1	46-2	218	208-5	63-7	278	265-9	81-3
39	37-3	11-4	99	94-7	28-9	159	152-1	46-5	219	209-4	64-0	279	266-8	81-6
40	38-3	11-7	100	95-6	29-2	160	153-0	46-8	220	210-4	64-3	280	267-8	81-9
41	39-2	12-0	101	96-6	29-5	161	154-0	47-1	221	211-3	64-6	281	268-7	82-2
42	40-2	12-3	102	97-5	29-8	162	154-9	47-4	222	212-3	64-9	282	269-7	82-4
43	41-1	12-6	103	98-5	30-1	163	155-9	47-7	223	213-3	65-2	283	270-6	82-7
44	42-1	12-9	104	99-5	30-4	164	156-8	47-9	224	214-2	65-5	284	271-6	83-0
45	43-0	13-2	105	100-4	30-7	165	157-8	48-2	225	215-2	65-8	285	272-5	83-3
46	44-0	13-4	106	101-4	31-0	166	158-7	48-5	226	216-1	66-1	286	273-5	83-6
47	44-9	13-7	107	102-3	31-3	167	159-7	48-8	227	217-1	66-4	287	274-5	83-9
48	45-9	14-0	108	103-3	31-6	168	160-7	49-1	228	218-0	66-7	288	275-4	84-2
49	46-9	14-3	109	104-2	31-9	169	161-6	49-4	229	219-0	67-0	289	276-4	84-5
50	47-8	14-6	110	105-2	32-2	170	162-6	49-7	230	220-0	67-2	290	277-3	84-8
51	48-8	14-9	111	106-1	32-5	171	163-5	50-0	231	220-9	67-5	291	278-3	85-1
52	49-7	15-2	112	107-1	32-7	172	164-5	50-3	232	221-9	67-8	292	279-2	85-4
53	50-7	15-5	113	108-1	33-0	173	165-4	50-6	233	222-8	68-1	293	280-2	85-7
54	51-6	15-8	114	109-0	33-3	174	166-4	50-9	234	223-8	68-4	294	281-2	86-0
55	52-6	16-1	115	110-0	33-6	175	167-4	51-2	235	224-7	68-7	295	282-1	86-2
56	53-6	16-4	116	110-9	33-9	176	168-3	51-5	236	225-7	69-0	296	283-1	86-5
57	54-5	16-7	117	111-9	34-2	177	169-3	51-7	237	226-6	69-3	297	284-0	86-8
58	55-5	17-0	118	112-8	34-5	178	170-2	52-0	238	227-6	69-6	298	285-0	87-1
59	56-4	17-2	119	113-8	34-8	179	171-2	52-3	239	228-6	69-9	299	285-9	87-4
60	57-4	17-5	120	114-8	35-1	180	172-1	52-6	240	229-5	70-2	300	286-9	87-7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 73 DEGREES

D 3

14	13-2	04-8	74	69-5	25-8	134	125-9	45-8	194	182-3	64-4	2
15	14-1	05-1	75	70-5	26-7	135	126-9	46-2	195	183-2	65-7	2
16	15-0	05-5	76	71-4	26-0	136	127-8	46-5	196	184-2	67-0	2
17	16-0	06-8	77	72-4	26-3	137	128-7	46-9	197	185-1	67-4	2
18	16-9	06-2	78	73-3	24-7	138	129-7	47-2	198	186-1	67-7	2
19	17-9	06-5	79	74-2	27-0	139	130-6	47-5	199	187-0	68-1	2
20	18-8	06-8	80	75-2	27-4	140	131-6	47-9	200	187-9	68-4	2
21	19-7	07-2	81	76-1	27-7	141	132-5	48-2	201	188-9	68-7	2
22	20-7	07-5	82	77-1	28-0	142	133-4	48-6	202	189-8	69-1	2
23	21-6	07-9	83	78-0	28-4	143	134-4	48-9	203	190-8	69-4	2
24	22-6	08-2	84	78-9	28-7	144	135-3	49-3	204	191-7	69-8	2
25	23-5	08-6	85	79-9	29-1	145	136-3	49-6	205	192-6	70-1	2
26	24-4	08-9	86	80-8	29-4	146	137-2	49-9	206	193-6	70-5	2
27	25-4	09-2	87	81-8	29-8	147	138-1	50-3	207	194-5	70-8	2
28	26-3	09-6	88	82-7	30-1	148	139-1	50-6	208	195-5	71-1	2
29	27-3	09-9	89	83-6	30-4	149	140-0	51-0	209	196-4	71-5	2
30	28-2	10-3	90	84-6	30-8	150	141-0	51-3	210	197-3	71-8	2
31	29-1	10-6	91	85-5	31-1	151	141-9	51-6	211	198-3	72-2	2
32	30-1	10-9	92	86-5	31-5	152	142-8	52-0	212	199-2	72-5	2
33	31-0	11-3	93	87-4	31-8	153	143-8	52-3	213	200-2	72-9	2
34	31-9	11-6	94	88-3	32-1	154	144-7	52-7	214	201-1	73-2	2
35	32-9	12-0	95	89-3	32-5	155	145-7	53-0	215	202-0	73-6	2
36	33-8	12-3	96	90-2	32-8	156	146-6	53-4	216	203-0	73-9	2
37	34-8	12-7	97	91-2	33-2	157	147-5	53-7	217	203-9	74-2	2
38	35-7	13-0	98	92-1	33-5	158	148-5	54-0	218	204-9	74-6	2
39	36-6	13-3	99	93-0	33-9	159	149-4	54-4	219	205-8	74-9	2
40	37-6	13-7	100	94-0	34-2	160	150-4	54-7	220	206-7	75-2	2
41	38-5	14-0	101	94-9	34-5	161	151-3	55-1	221	207-7	75-6	2
42	39-5	14-4	102	95-8	34-9	162	152-2	55-4	222	208-6	75-9	2
43	40-4	14-7	103	96-8	35-2	163	153-2	55-7	223	209-6	76-3	2
44	41-3	15-0	104	97-7	35-6	164	154-1	56-1	224	210-5	76-6	2
45	42-3	15-4	105	98-7	35-9	165	155-0	56-4	225	211-4	77-0	2
46	43-2	15-7	106	99-6	36-3	166	156-0	56-8	226	212-4	77-3	2

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 21 DEGREES. 61

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00-9	00-4	61	58-9	21-9	121	113-0	43-4	181	169-0	64-9	241	225-0	86-4
2	01-9	00-7	62	57-9	22-2	122	113-9	43-7	182	169-9	65-2	242	225-9	86-7
3	02-8	01-1	63	56-8	22-6	123	114-8	44-1	183	170-8	65-6	243	226-9	87-1
4	03-7	01-4	64	55-7	22-9	124	115-8	44-4	184	171-8	65-9	244	227-8	87-4
5	04-7	01-8	65	54-7	23-3	125	116-7	44-8	185	172-7	66-3	245	228-7	87-8
6	05-6	02-2	66	53-6	23-7	126	117-6	45-2	186	173-6	66-7	246	229-7	88-2
7	06-5	02-5	67	52-5	24-0	127	118-6	45-5	187	174-6	67-0	247	230-6	88-5
8	07-5	02-9	68	51-5	24-4	128	119-5	45-9	188	175-5	67-4	248	231-5	88-9
9	08-4	03-2	69	50-4	24-7	129	120-4	46-2	189	176-4	67-7	249	232-5	89-2
10	09-3	03-6	70	49-4	25-1	130	121-4	46-6	190	177-4	68-1	250	233-4	89-6
11	10-3	03-9	71	48-3	25-4	131	122-3	46-9	191	178-3	68-4	251	234-3	90-0
12	11-2	04-3	72	47-2	25-8	132	123-2	47-3	192	179-2	68-8	252	235-3	90-3
13	12-1	04-7	73	46-2	26-2	133	124-2	47-7	193	180-2	69-2	253	236-2	90-7
14	13-1	05-0	74	45-1	26-5	134	125-1	48-0	194	181-1	69-5	254	237-1	91-0
15	14-0	05-4	75	44-0	26-9	135	126-0	48-4	195	182-0	69-9	255	238-1	91-4
16	14-9	05-7	76	43-0	27-2	136	127-0	48-7	196	183-0	70-2	256	239-0	91-7
17	15-9	06-1	77	41-9	27-6	137	127-9	49-1	197	183-9	70-6	257	239-9	92-1
18	16-8	06-5	78	40-8	28-0	138	128-8	49-5	198	184-8	71-0	258	240-8	92-5
19	17-7	06-8	79	39-7	28-3	139	129-8	49-8	199	185-8	71-3	259	241-8	92-8
20	18-7	07-2	80	38-7	28-7	140	130-7	50-2	200	186-7	71-7	260	242-7	93-2
21	19-6	07-5	81	37-6	29-0	141	131-6	50-5	201	187-6	72-0	261	243-7	93-5
22	20-5	07-9	82	36-6	29-4	142	132-6	50-9	202	188-6	72-4	262	244-6	93-9
23	21-5	08-2	83	35-5	29-7	143	133-5	51-2	203	189-5	72-7	263	245-5	94-3
24	22-4	08-6	84	34-4	30-1	144	134-4	51-6	204	190-4	73-1	264	246-5	94-6
25	23-3	09-0	85	33-3	30-5	145	135-4	52-0	205	191-4	73-5	265	247-4	95-0
26	24-3	09-3	86	32-2	30-8	146	136-3	52-3	206	192-3	73-8	266	248-3	95-3
27	25-2	09-7	87	31-2	31-2	147	137-2	52-7	207	193-3	74-2	267	249-3	95-7
28	26-1	10-0	88	30-1	31-5	148	138-2	53-0	208	194-2	74-5	268	250-2	96-0
29	27-1	10-4	89	29-1	31-9	149	139-1	53-4	209	195-1	74-9	269	251-1	96-4
30	28-0	10-8	90	28-0	32-3	150	140-0	53-8	210	196-1	75-3	270	252-1	96-8
31	28-9	11-1	91	26-9	32-6	151	141-0	54-1	211	197-0	75-6	271	253-0	97-1
32	29-9	11-5	92	25-9	33-0	152	141-9	54-5	212	197-9	76-0	272	253-9	97-5
33	30-8	11-8	93	24-8	33-3	153	142-8	54-8	213	198-9	76-3	273	254-9	97-8
34	31-7	12-2	94	23-8	33-7	154	143-8	55-2	214	199-8	76-7	274	255-8	98-2
35	32-7	12-5	95	22-7	34-0	155	144-7	55-5	215	200-7	77-0	275	256-7	98-6
36	33-6	12-9	96	21-7	34-4	156	145-6	55-9	216	201-7	77-4	276	257-7	98-9
37	34-5	13-3	97	20-6	34-8	157	146-6	56-3	217	202-6	77-8	277	258-6	99-3
38	35-5	13-6	98	19-5	35-1	158	147-5	56-6	218	203-5	78-1	278	259-5	99-6
39	36-4	14-0	99	18-4	35-5	159	148-4	57-0	219	204-5	78-5	279	260-5	100-0
40	37-3	14-3	100	17-3	35-8	160	149-4	57-3	220	205-4	78-8	280	261-4	100-3
41	38-3	14-7	101	16-2	36-2	161	150-3	57-7	221	206-3	79-2	281	262-3	100-7
42	39-2	15-1	102	15-2	36-6	162	151-2	58-1	222	207-3	79-6	282	263-3	101-1
43	40-1	15-4	103	14-1	36-9	163	152-2	58-4	223	208-2	79-9	283	264-2	101-4
44	41-1	15-8	104	13-1	37-3	164	153-1	58-8	224	209-1	80-3	284	265-1	101-8
45	42-0	16-1	105	12-0	37-6	165	154-0	59-1	225	210-1	80-6	285	266-1	102-1
46	42-9	16-5	106	11-0	38-0	166	155-0	59-5	226	211-0	81-0	286	267-0	102-5
47	43-9	16-8	107	9-9	38-3	167	155-9	59-8	227	211-9	81-3	287	267-9	102-9
48	44-8	17-2	108	8-8	38-7	168	156-8	60-2	228	212-9	81-7	288	268-9	103-2
49	45-7	17-6	109	7-7	39-1	169	157-8	60-6	229	213-8	82-1	289	269-8	103-6
50	46-7	17-9	110	6-6	39-4	170	158-7	60-9	230	214-7	82-4	290	270-7	103-9
51	47-6	18-3	111	5-5	39-8	171	159-6	61-3	231	215-7	82-8	291	271-7	104-3
52	48-5	18-6	112	4-4	40-1	172	160-6	61-6	232	216-6	83-1	292	272-6	104-6
53	49-5	19-0	113	3-3	40-5	173	161-5	62-0	233	217-5	83-5	293	273-5	105-0
54	50-4	19-4	114	2-2	40-9	174	162-4	62-4	234	218-5	83-9	294	274-5	105-4
55	51-3	19-7	115	1-1	41-2	175	163-4	62-7	235	219-4	84-2	295	275-4	105-7
56	52-3	20-1	116	0-0	41-6	176	164-3	63-1	236	220-3	84-6	296	276-3	106-1
57	53-2	20-4	117	0-9	41-9	177	165-2	63-4	237	221-3	84-9	297	277-3	106-4
58	54-1	20-8	118	11-8	42-3	178	166-2	63-8	238	222-2	85-3	298	278-2	106-8
59	55-1	21-1	119	11-1	42-6	179	167-1	64-1	239	223-1	85-6	299	279-1	107-2
60	56-0	21-5	120	11-0	43-0	180	168-0	64-5	240	224-1	86-0	300	280-1	107-5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 69 DEGREES.

64 DIFFERENCE OF LATITUDE AND DEPARTURE FOR 24 DEGREES. [TABLE 5.]

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°0'	00.4	61	55°7'	24.8	121	110°5'	49.2	181	165°4	73.6	241	220°2	98.0
2	01°8'	00.8	62	56°6'	25.2	122	111°5'	49.6	182	166°3	74.0	242	221°1	98.4
3	02°7'	01.2	63	57°6'	25.6	123	112°4'	50.0	183	167°2	74.4	243	222°0	98.8
4	03°7'	01.6	64	58°5'	26.0	124	113°3'	50.4	184	168°1	74.8	244	222°9	99.2
5	04°6'	02.0	65	59°4'	26.4	125	114°2'	50.8	185	169°0	75.2	245	223°8	99.6
6	05°5'	02.4	66	60°3'	26.8	126	115°1'	51.2	186	169°9	75.6	246	224°7	100.0
7	06°4'	02.8	67	61°2'	27.3	127	116°0'	51.7	187	170°8	76.1	247	225°6	100.5
8	07°3'	03.3	68	62°1'	27.7	128	116°9'	52.1	188	171°7	76.5	248	226°5	100.9
9	08°2'	03.7	69	63°0'	28.1	129	117°8'	52.5	189	172°6	76.9	249	227°4	101.3
10	09°1'	04.1	70	63°9'	28.5	130	118°7'	52.9	190	173°5	77.3	250	228°3	101.7
11	10°0'	04.5	71	64°8'	28.9	131	119°6'	53.3	191	174°4	77.7	251	229°2	102.1
12	11°0'	04.9	72	65°8'	29.3	132	120°5'	53.7	192	175°3	78.1	252	230°1	102.5
13	11°9'	05.3	73	66°7'	29.7	133	121°4'	54.1	193	176°2	78.5	253	231°0	102.9
14	12°8'	05.7	74	67°6'	30.1	134	122°3'	54.5	194	177°1	78.9	254	231°9	103.3
15	13°7'	06.1	75	68°5'	30.5	135	123°2'	54.9	195	178°0	79.3	255	232°8	103.7
16	14°6'	06.5	76	69°4'	30.9	136	124°1'	55.3	196	178°9	79.7	256	233°7	104.1
17	15°5'	06.9	77	70°3'	31.3	137	125°0'	55.7	197	179°8	80.1	257	234°6	104.5
18	16°4'	07.3	78	71°2'	31.7	138	125°9'	56.1	198	180°7	80.5	258	235°5	104.9
19	17°3'	07.7	79	72°1'	32.1	139	126°8'	56.5	199	181°6	80.9	259	236°4	105.3
20	18°3'	08.1	80	73°0'	32.5	140	127°7'	56.9	200	182°5	81.3	260	237°3	105.7
21	19°2'	08.5	81	74°0'	32.9	141	128°6'	57.3	201	183°4	81.8	261	238°2	106.1
22	20°1'	08.9	82	74°9'	33.4	142	129°5'	57.8	202	184°3	82.2	262	239°1	106.5
23	21°0'	09.4	83	75°8'	33.8	143	130°4'	58.2	203	185°2	82.6	263	240°0	106.9
24	21°9'	09.8	84	76°7'	34.2	144	131°3'	58.6	204	186°1	83.0	264	241°0	107.3
25	22°8'	10.2	85	77°6'	34.6	145	132°2'	59.0	205	187°0	83.4	265	241°9	107.7
26	23°8'	10.6	86	78°5'	35.0	146	133°1'	59.4	206	187°9	83.8	266	242°8	108.1
27	24°7'	11.0	87	79°4'	35.4	147	134°0'	59.8	207	188°8	84.2	267	243°7	108.5
28	25°6'	11.4	88	80°3'	35.8	148	134°9'	60.2	208	189°7	84.6	268	244°6	108.9
29	26°5'	11.8	89	81°2'	36.2	149	135°8'	60.6	209	190°6	85.0	269	245°5	109.3
30	27°4'	12.2	90	82°1'	36.6	150	136°7'	61.0	210	191°5	85.4	270	246°4	109.7
31	28°3'	12.6	91	83°0'	37.0	151	137°6'	61.4	211	192°4	85.8	271	247°3	110.1
32	29°2'	13.0	92	84°0'	37.4	152	138°5'	61.8	212	193°3	86.2	272	248°2	110.5
33	30°1'	13.4	93	85°0'	37.8	153	139°4'	62.2	213	194°2	86.6	273	249°1	110.9
34	31°1'	13.8	94	85°9'	38.2	154	140°3'	62.6	214	195°1	87.0	274	250°0	111.3
35	32°0'	14.2	95	86°8'	38.6	155	141°2'	63.0	215	196°0	87.4	275	251°0	111.7
36	32°9'	14.6	96	87°7'	39.0	156	142°1'	63.4	216	196°9	87.8	276	251°9	112.1
37	33°8'	15.0	97	88°6'	39.4	157	143°0'	63.8	217	197°8	88.2	277	252°8	112.5
38	34°7'	15.4	98	89°5'	39.8	158	143°9'	64.2	218	198°7	88.6	278	253°7	112.9
39	35°6'	15.8	99	90°4'	40.2	159	144°8'	64.6	219	199°6	89.0	279	254°6	113.3
40	36°5'	16.2	100	91°3'	40.6	160	145°7'	65.0	220	200°5	89.4	280	255°5	113.7
41	37°5'	16.7	101	92°3'	41.1	161	147°1'	65.5	221	201°9	89.9	281	256°7	114.1
42	38°4'	17.1	102	93°2'	41.5	162	148°0'	65.9	222	202°8	90.3	282	257°6	114.5
43	39°3'	17.5	103	94°1'	41.9	163	148°9'	66.3	223	203°7	90.7	283	258°5	114.9
44	40°2'	17.9	104	95°0'	42.3	164	149°8'	66.7	224	204°6	91.1	284	259°4	115.3
45	41°1'	18.3	105	95°9'	42.7	165	150°7'	67.1	225	205°5	91.5	285	260°3	115.7
46	42°0'	18.7	106	96°8'	43.1	166	151°6'	67.5	226	206°4	91.9	286	261°2	116.1
47	42°9'	19.1	107	97°7'	43.5	167	152°5'	67.9	227	207°3	92.3	287	262°1	116.5
48	43°8'	19.5	108	98°6'	43.9	168	153°4'	68.3	228	208°2	92.7	288	263°0	116.9
49	44°8'	19.9	109	99°5'	44.3	169	154°3'	68.7	229	209°1	93.1	289	264°0	117.3
50	45°7'	20.3	110	100°5'	44.7	170	155°3'	69.1	230	210°1	93.5	290	264°9	117.7
51	46°6'	20.7	111	101°4'	45.1	171	156°2'	69.5	231	211°0	94.0	291	265°8	118.1
52	47°5'	21.2	112	102°3'	45.6	172	157°1'	70.0	232	211°9	94.4	292	266°7	118.5
53	48°4'	21.6	113	103°2'	46.0	173	158°0'	70.4	233	212°8	94.8	293	267°6	118.9
54	49°3'	22.0	114	104°1'	46.4	174	159°0'	70.8	234	213°8	95.2	294	268°5	119.3
55	50°2'	22.4	115	105°1'	46.8	175	159°9'	71.2	235	214°7	95.6	295	269°4	119.7
56	51°2'	22.8	116	106°0'	47.2	176	160°8'	71.6	236	215°6	96.0	296	270°3	120.1
57	52°1'	23.2	117	106°9'	47.6	177	161°7'	72.0	237	216°5	96.4	297	271°2	120.5
58	53°0'	23.6	118	107°8'	48.0	178	162°6'	72.4	238	217°4	96.8	298	272°1	120.9
59	53°9'	24.0	119	108°7'	48.4	179	163°5'	72.8	239	218°3	97.2	299	273°0	121.3
60	54°8'	24.4	120	109°6'	48.8	180	164°4'	73.2	240	219°3	97.6	300	274°0	121.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 66 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 25 DEGREES.

65

Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.
1	00.9	00.4	61	55.3	25.8	121	109.7	51.1	181	164.0	76.5	241	218.4	101.9
2	01.8	00.8	62	56.2	26.2	122	110.6	51.6	182	164.9	76.9	242	219.3	102.3
3	02.7	01.3	63	57.1	26.6	123	111.5	52.0	183	165.9	77.3	243	220.2	102.7
4	03.6	01.7	64	58.0	27.0	124	112.4	52.4	184	166.8	77.8	244	221.1	103.1
5	04.5	02.1	65	58.9	27.5	125	113.3	52.8	185	167.7	78.2	245	222.0	103.5
6	05.4	02.5	66	59.8	27.9	126	114.2	53.2	186	168.6	78.6	246	223.0	104.0
7	06.3	03.0	67	60.7	28.3	127	115.1	53.7	187	169.5	79.0	247	223.9	104.4
8	07.3	03.4	68	61.6	28.7	128	116.0	54.1	188	170.4	79.5	248	224.8	104.8
9	08.2	03.8	69	62.5	29.2	129	116.9	54.5	189	171.3	79.9	249	225.7	105.2
10	09.1	04.2	70	63.4	29.6	130	117.8	54.9	190	172.2	80.3	250	226.6	105.7
11	10.0	04.6	71	64.3	30.0	131	118.7	55.4	191	173.1	80.7	251	227.5	106.1
12	10.9	05.1	72	65.3	30.4	132	119.6	55.8	192	174.0	81.1	252	228.4	106.5
13	11.8	05.5	73	66.2	30.9	133	120.5	56.2	193	174.9	81.6	253	229.3	106.9
14	12.7	05.9	74	67.1	31.3	134	121.4	56.6	194	175.8	82.0	254	230.2	107.3
15	13.6	06.3	75	68.0	31.7	135	122.4	57.1	195	176.7	82.4	255	231.1	107.8
16	14.5	06.8	76	68.9	32.1	136	123.3	57.5	196	177.6	82.8	256	232.0	108.2
17	15.4	07.2	77	69.8	32.5	137	124.2	57.9	197	178.5	83.3	257	232.9	108.6
18	16.3	07.6	78	70.7	33.0	138	125.1	58.3	198	179.4	83.7	258	233.8	109.0
19	17.2	08.0	79	71.6	33.4	139	126.0	58.7	199	180.4	84.1	259	234.7	109.5
20	18.1	08.5	80	72.5	33.8	140	126.9	59.2	200	181.3	84.5	260	235.6	109.9
21	19.0	08.9	81	73.4	34.2	141	127.8	59.6	201	182.2	84.9	261	236.5	110.3
22	19.9	09.3	82	74.3	34.7	142	128.7	60.0	202	183.1	85.4	262	237.5	110.7
23	20.8	09.7	83	75.2	35.1	143	129.6	60.4	203	184.0	85.8	263	238.4	111.1
24	21.8	10.1	84	76.1	35.5	144	130.5	60.9	204	184.9	86.2	264	239.3	111.6
25	22.7	10.6	85	77.0	35.9	145	131.4	61.3	205	185.8	86.6	265	240.2	112.0
26	23.6	11.0	86	77.9	36.3	146	132.3	61.7	206	186.7	87.1	266	241.1	112.4
27	24.5	11.4	87	78.8	36.8	147	133.2	62.1	207	187.6	87.5	267	242.0	112.8
28	25.4	11.8	88	79.8	37.2	148	134.1	62.5	208	188.5	87.9	268	242.9	113.3
29	26.3	12.3	89	80.7	37.6	149	135.0	63.0	209	189.4	88.3	269	243.8	113.7
30	27.2	12.7	90	81.6	38.0	150	135.9	63.4	210	190.3	88.7	270	244.7	114.1
31	28.1	13.1	91	82.5	38.5	151	136.9	63.8	211	191.2	89.2	271	245.6	114.5
32	29.0	13.5	92	83.4	38.9	152	137.8	64.2	212	192.1	89.6	272	246.5	115.0
33	29.9	13.9	93	84.3	39.3	153	138.7	64.7	213	193.0	90.0	273	247.4	115.4
34	30.8	14.4	94	85.2	39.7	154	139.6	65.1	214	193.9	90.4	274	248.3	115.8
35	31.7	14.8	95	86.1	40.1	155	140.5	65.5	215	194.9	90.9	275	249.2	116.2
36	32.6	15.2	96	87.0	40.6	156	141.4	65.9	216	195.8	91.3	276	250.1	116.6
37	33.5	15.6	97	87.9	41.0	157	142.3	66.4	217	196.7	91.7	277	251.0	117.1
38	34.4	16.1	98	88.8	41.4	158	143.2	66.8	218	197.6	92.1	278	252.0	117.5
39	35.3	16.5	99	89.7	41.8	159	144.1	67.2	219	198.5	92.6	279	252.9	117.9
40	36.3	16.9	100	90.6	42.3	160	145.0	67.6	220	199.4	93.0	280	253.8	118.3
41	37.2	17.3	101	91.5	42.7	161	145.9	68.0	221	200.3	93.4	281	254.7	118.8
42	38.1	17.7	102	92.4	43.1	162	146.8	68.5	222	201.2	93.8	282	255.6	119.2
43	39.0	18.2	103	93.3	43.5	163	147.7	68.9	223	202.1	94.2	283	256.5	119.6
44	39.9	18.6	104	94.3	44.0	164	148.6	69.3	224	203.0	94.7	284	257.4	120.0
45	40.8	19.0	105	95.2	44.4	165	149.5	69.7	225	203.9	95.1	285	258.3	120.4
46	41.7	19.4	106	96.1	44.8	166	150.4	70.2	226	204.8	95.5	286	259.2	120.9
47	42.6	19.9	107	97.0	45.2	167	151.4	70.6	227	205.7	95.9	287	260.1	121.3
48	43.5	20.3	108	97.9	45.6	168	152.3	71.0	228	206.6	96.4	288	261.0	121.7
49	44.4	20.7	109	98.8	46.1	169	153.2	71.4	229	207.5	96.8	289	261.9	122.1
50	45.3	21.1	110	99.7	46.5	170	154.1	71.8	230	208.5	97.2	290	262.8	122.6
51	46.2	21.6	111	100.6	46.9	171	155.0	72.3	231	209.4	97.6	291	263.7	123.0
52	47.1	22.0	112	101.5	47.3	172	155.9	72.7	232	210.3	98.0	292	264.6	123.4
53	48.0	22.4	113	102.4	47.8	173	156.8	73.1	233	211.2	98.5	293	265.5	123.8
54	48.9	22.8	114	103.3	48.2	174	157.7	73.5	234	212.1	98.9	294	266.5	124.2
55	49.8	23.2	115	104.2	48.6	175	158.6	74.0	235	213.0	99.3	295	267.4	124.7
56	50.8	23.7	116	105.1	49.0	176	159.5	74.4	236	213.9	99.7	296	268.3	125.1
57	51.7	24.1	117	106.0	49.4	177	160.4	74.8	237	214.8	100.2	297	269.2	125.5
58	52.6	24.5	118	106.9	49.9	178	161.3	75.2	238	215.7	100.6	298	270.1	125.9
59	53.5	24.9	119	107.9	50.3	179	162.2	75.6	239	216.6	101.0	299	271.0	126.4
60	54.4	25.4	120	108.8	50.7	180	163.1	76.1	240	217.5	101.4	300	271.9	126.8

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 65 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°0'	00.4	61	54.8	26.7	121	108.8	53.0	181	162.7	79.3	241	216.6	1			
2	01°0'	00.9	62	55.7	27.2	122	109.7	53.5	182	163.6	79.8	242	217.5	1			
3	02°0'	01.3	63	56.6	27.6	123	110.6	53.9	183	164.5	80.2	243	218.4	1			
4	03°0'	01.8	64	57.5	28.1	124	111.5	54.4	184	165.4	80.7	244	219.3	1			
5	04°0'	02.2	65	58.4	28.5	125	112.3	54.8	185	166.3	81.1	245	220.2	1			
6	05°0'	02.6	66	59.3	28.9	126	113.2	55.2	186	167.2	81.5	246	221.1	1			
7	06°0'	03.1	67	60.2	29.4	127	114.1	55.7	187	168.1	82.0	247	222.0	1			
8	07°0'	03.5	68	61.1	29.8	128	115.0	56.1	188	169.0	82.4	248	222.9	1			
9	08°0'	03.9	69	62.0	30.2	129	115.9	56.5	189	169.9	82.9	249	223.8	1			
10	09°0'	04.4	70	62.9	30.7	130	116.8	57.0	190	170.8	83.3	250	224.7	1			
11	09°0'	04.8	71	63.8	31.1	131	117.7	57.4	191	171.7	83.7	251	225.6	1			
12	10°0'	05.3	72	64.7	31.6	132	118.6	57.9	192	172.6	84.2	252	226.5	1			
13	11°0'	05.7	73	65.6	32.0	133	119.5	58.3	193	173.5	84.6	253	227.4	1			
14	12°0'	06.1	74	66.5	32.4	134	120.4	58.7	194	174.4	85.0	254	228.3	1			
15	13°0'	06.6	75	67.4	32.9	135	121.3	59.2	195	175.3	85.5	255	229.2	1			
16	14°0'	07.0	76	68.3	33.3	136	122.2	59.6	196	176.2	85.9	256	230.1	1			
17	15°0'	07.5	77	69.2	33.8	137	123.1	60.1	197	177.1	86.4	257	231.0	1			
18	16°0'	07.9	78	70.1	34.2	138	124.0	60.5	198	178.0	86.8	258	231.9	1			
19	17°0'	08.3	79	71.0	34.6	139	124.9	60.9	199	178.9	87.2	259	232.8	1			
20	18°0'	08.8	80	71.9	35.1	140	125.8	61.4	200	179.8	87.7	260	233.7	1			
21	18°0'	09.2	81	72.8	35.5	141	126.7	61.8	201	180.7	88.1	261	234.6	1			
22	19°0'	09.6	82	73.7	35.9	142	127.6	62.2	202	181.6	88.6	262	235.5	1			
23	20°0'	10.1	83	74.6	36.4	143	128.5	62.7	203	182.5	89.0	263	236.4	1			
24	21°0'	10.5	84	75.5	36.8	144	129.4	63.1	204	183.4	89.4	264	237.3	1			
25	22°0'	11.0	85	76.4	37.3	145	130.3	63.6	205	184.3	89.9	265	238.2	1			
26	23°0'	11.4	86	77.3	37.7	146	131.2	64.0	206	185.2	90.3	266	239.1	1			
27	24°0'	11.8	87	78.2	38.1	147	132.1	64.4	207	186.1	90.7	267	240.0	1			
28	25°0'	12.3	88	79.1	38.6	148	133.0	64.9	208	186.9	91.2	268	240.9	1			
29	26°0'	12.7	89	80.0	39.0	149	133.9	65.3	209	187.8	91.6	269	241.8	1			
30	27°0'	13.2	90	80.9	39.5	150	134.8	65.8	210	188.7	92.1	270	242.7	1			
31	27°0'	13.6	91	81.8	39.9	151	135.7	66.2	211	189.6	92.5	271	243.6	1			
32	28°0'	14.0	92	82.7	40.3	152	136.6	66.6	212	190.5	92.9	272	244.5	1			
33	29°0'	14.5	93	83.6	40.8	153	137.5	67.1	213	191.4	93.4	273	245.4	1			
34	30°0'	14.9	94	84.5	41.2	154	138.4	67.5	214	192.3	93.8	274	246.3	1			
35	31°0'	15.3	95	85.4	41.6	155	139.3	67.9	215	193.2	94.2	275	247.2	1			
36	32°0'	15.8	96	86.3	42.1	156	140.2	68.4	216	194.1	94.7	276	248.1	1			
37	33°0'	16.2	97	87.2	42.5	157	141.1	68.8	217	195.0	95.1	277	249.0	1			
38	34°0'	16.7	98	88.1	43.0	158	142.0	69.3	218	195.9	95.6	278	249.9	1			
39	35°0'	17.1	99	89.0	43.4	159	142.9	69.7	219	196.8	96.0	279	250.8	1			
40	36°0'	17.5	100	89.9	43.8	160	143.8	70.1	220	197.7	96.4	280	251.7	1			
41	36°0'	18.0	101	90.8	44.3	161	144.7	70.6	221	198.6	96.9	281	252.6	1			
42	37°0'	18.4	102	91.7	44.7	162	145.6	71.0	222	199.5	97.3	282	253.5	1			
43	38°0'	18.8	103	92.6	45.2	163	146.5	71.5	223	200.4	97.8	283	254.4	1			
44	39°0'	19.3	104	93.5	45.6	164	147.4	71.9	224	201.3	98.2	284	255.3	1			
45	40°0'	19.7	105	94.4	46.0	165	148.3	72.3	225	202.2	98.6	285	256.2	1			
46	41°0'	20.2	106	95.3	46.5	166	149.2	72.8	226	203.1	99.1	286	257.1	1			
47	42°0'	20.6	107	96.2	46.9	167	150.1	73.2	227	204.0	99.5	287	258.0	1			
48	43°0'	21.0	108	97.1	47.3	168	151.0	73.6	228	204.9	99.9	288	258.9	1			
49	44°0'	21.5	109	98.0	47.8	169	151.9	74.1	229	205.8	100.4	289	259.8	1			
50	44°0'	21.9	110	98.9	48.2	170	152.8	74.5	230	206.7	100.8	290	260.7	1			
51	45°0'	22.4	111	99.8	48.7	171	153.7	75.0	231	207.6	101.3	291	261.6	1			
52	46°0'	22.8	112	100.7	49.1	172	154.6	75.4	232	208.5	101.7	292	262.5	1			
53	47°0'	23.2	113	101.6	49.5	173	155.5	75.8	233	209.4	102.1	293	263.4	1			
54	48°0'	23.7	114	102.5	50.0	174	156.4	76.3	234	210.3	102.6	294	264.3	1			
55	49°0'	24.1	115	103.4	50.4	175	157.3	76.7	235	211.2	103.0	295	265.2	1			
56	50°0'	24.5	116	104.3	50.9	176	158.2	77.2	236	212.1	103.5	296	266.1	1			
57	51°0'	25.0	117	105.2	51.3	177	159.1	77.6	237	213.0	103.9	297	267.0	1			
58	52°0'	25.4	118	106.1	51.7	178	160.0	78.0	238	213.9	104.3	298	267.9	1			
59	53°0'	25.9	119	107.0	52.2	179	160.9	78.5	239	214.8	104.8	299	268.8	1			
60	53°0'	26.3	120	107.9	52.6	180	161.8	78.9	240	215.7	105.2	300	269.7	1			
ist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 27 DEGREES.

67

st.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	009	005	61	54.4	27.7	121	107.8	54.9	181	161.3	82.2	241	214.7	109.4
2	018	009	62	55.2	28.1	122	108.7	55.4	182	162.2	82.6	242	215.6	109.9
3	027	014	63	56.1	28.6	123	109.6	55.8	183	163.1	83.1	243	216.5	110.3
4	036	018	64	57.0	29.1	124	110.5	56.3	184	163.9	83.5	244	217.4	110.8
5	045	023	65	57.9	29.5	125	111.4	56.7	185	164.8	84.0	245	218.3	111.2
6	053	027	66	58.8	30.0	126	112.3	57.2	186	165.7	84.4	246	219.2	111.7
7	062	032	67	59.7	30.4	127	113.2	57.7	187	166.6	84.9	247	220.1	112.1
8	071	036	68	60.6	30.9	128	114.0	58.1	188	167.5	85.4	248	221.0	112.6
9	080	041	69	61.5	31.3	129	114.9	58.6	189	168.4	85.8	249	221.9	113.0
10	089	045	70	62.4	31.8	130	115.8	59.0	190	169.3	86.3	250	222.8	113.5
11	098	050	71	63.3	32.2	131	116.7	59.5	191	170.2	86.7	251	223.6	114.0
12	107	054	72	64.2	32.7	132	117.6	59.9	192	171.1	87.2	252	224.5	114.4
13	116	059	73	65.0	33.1	133	118.5	60.4	193	172.0	87.6	253	225.4	114.9
14	125	064	74	65.9	33.6	134	119.4	60.8	194	172.9	88.1	254	226.3	115.3
15	134	068	75	66.8	34.0	135	120.3	61.3	195	173.7	88.5	255	227.2	115.8
16	143	073	76	67.7	34.5	136	121.2	61.7	196	174.6	89.0	256	228.1	116.2
17	151	077	77	68.6	35.0	137	122.1	62.2	197	175.5	89.4	257	229.0	116.7
18	160	082	78	69.5	35.4	138	123.0	62.7	198	176.4	89.9	258	229.9	117.1
19	169	086	79	70.4	35.9	139	123.8	63.1	199	177.3	90.3	259	230.8	117.6
20	178	091	80	71.3	36.3	140	124.7	63.6	200	178.2	90.8	260	231.7	118.0
21	187	095	81	72.2	36.8	141	125.6	64.0	201	179.1	91.3	261	232.6	118.5
22	196	100	82	73.1	37.2	142	126.5	64.5	202	180.0	91.7	262	233.4	118.9
23	205	104	83	74.0	37.7	143	127.4	64.9	203	180.9	92.2	263	234.3	119.4
24	214	109	84	74.8	38.1	144	128.3	65.4	204	181.8	92.6	264	235.2	119.9
25	223	113	85	75.7	38.6	145	129.2	65.8	205	182.7	93.1	265	236.1	120.3
26	232	118	86	76.6	39.0	146	130.1	66.3	206	183.5	93.5	266	237.0	120.8
27	241	123	87	77.5	39.5	147	131.0	66.7	207	184.4	94.0	267	237.9	121.2
28	249	127	88	78.4	40.0	148	131.9	67.2	208	185.3	94.4	268	238.8	121.7
29	258	132	89	79.3	40.4	149	132.8	67.6	209	186.2	94.9	269	239.7	122.1
30	267	136	90	80.2	40.9	150	133.7	68.1	210	187.1	95.3	270	240.6	122.6
31	276	141	91	81.1	41.3	151	134.5	68.6	211	188.0	95.8	271	241.5	123.0
32	285	145	92	82.0	41.8	152	135.4	69.0	212	188.9	96.2	272	242.4	123.5
33	294	150	93	82.9	42.2	153	136.3	69.5	213	189.8	96.7	273	243.2	123.9
34	303	154	94	83.8	42.7	154	137.2	69.9	214	190.7	97.2	274	244.1	124.4
35	312	159	95	84.6	43.1	155	138.1	70.4	215	191.6	97.6	275	245.0	124.8
36	321	163	96	85.5	43.6	156	139.0	70.8	216	192.5	98.1	276	245.9	125.3
37	330	168	97	86.4	44.0	157	139.9	71.3	217	193.3	98.5	277	246.8	125.8
38	339	173	98	87.3	44.5	158	140.8	71.7	218	194.2	99.0	278	247.7	126.2
39	347	177	99	88.2	44.9	159	141.7	72.2	219	195.1	99.4	279	248.6	126.7
40	356	182	100	89.1	45.4	160	142.6	72.6	220	196.0	99.9	280	249.5	127.1
41	365	186	101	90.0	45.9	161	143.5	73.1	221	196.9	100.3	281	250.4	127.6
42	374	191	102	90.9	46.3	162	144.3	73.5	222	197.8	100.8	282	251.3	128.0
43	383	195	103	91.8	46.8	163	145.2	74.0	223	198.7	101.2	283	252.2	128.5
44	392	200	104	92.7	47.2	164	146.1	74.5	224	199.6	101.7	284	253.0	128.9
45	401	204	105	93.6	47.7	165	147.0	74.9	225	200.5	102.1	285	253.9	129.4
46	410	209	106	94.4	48.1	166	147.9	75.4	226	201.4	102.6	286	254.8	129.8
47	419	213	107	95.3	48.6	167	148.8	75.8	227	202.3	103.1	287	255.7	130.3
48	428	218	108	96.2	49.0	168	149.7	76.3	228	203.1	103.5	288	256.6	130.7
49	437	222	109	97.1	49.5	169	150.6	76.7	229	204.0	104.0	289	257.5	131.2
50	446	227	110	98.0	49.9	170	151.5	77.2	230	204.9	104.4	290	258.4	131.7
51	454	232	111	98.9	50.4	171	152.4	77.6	231	205.8	104.9	291	259.3	132.1
52	463	236	112	99.8	50.8	172	153.3	78.1	232	206.7	105.3	292	260.2	132.6
53	472	241	113	100.7	51.3	173	154.1	78.5	233	207.6	105.8	293	261.1	133.0
54	481	245	114	101.6	51.8	174	155.0	79.0	234	208.5	106.2	294	262.0	133.5
55	490	250	115	102.5	52.2	175	155.9	79.4	235	209.4	106.7	295	262.8	133.9
56	499	254	116	103.4	52.7	176	156.8	79.9	236	210.3	107.1	296	263.7	134.4
57	508	259	117	104.2	53.1	177	157.7	80.4	237	211.2	107.6	297	264.6	134.8
58	517	263	118	105.1	53.6	178	158.6	80.8	238	212.1	108.0	298	265.5	135.3
59	526	268	119	106.0	54.0	179	159.5	81.3	239	213.0	108.5	299	266.4	135.7
60	535	272	120	106.9	54.5	180	160.4	81.7	240	213.8	109.0	300	267.3	136.2
st.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 63 DEGREES.

FOR 20 DEGREES.															LAT.		
Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	
1	009	005	61	589	286	121	1068	568	181	1598	850	241	2128	11	10	10	
2	018	009	62	547	291	122	1077	573	182	1607	854	243	2137	12	11	11	
3	026	014	63	556	296	123	1086	577	183	1616	859	245	2146	13	12	12	
4	035	019	64	565	300	124	1095	582	184	1625	864	247	2154	14	13	13	
5	044	023	65	574	305	125	1104	587	185	1634	869	249	2163	15	14	14	
6	053	028	66	583	310	126	1113	592	186	1643	873	246	2172	16	15	15	
7	062	033	67	592	315	127	1122	597	187	1652	878	247	2181	17	16	16	
8	071	038	68	600	319	128	1130	601	188	1660	883	248	2190	18	17	17	
9	079	042	69	609	324	129	1139	606	189	1669	887	249	2199	19	18	18	
10	088	047	70	618	329	130	1148	610	190	1678	892	250	2207	20	19	19	
11	097	052	71	627	333	131	1157	615	191	1686	897	251	2216	21	20	20	
12	106	056	72	636	338	132	1165	620	192	1695	901	252	2225	22	21	21	
13	115	061	73	645	343	133	1174	624	193	1704	906	253	2234	23	22	22	
14	124	066	74	653	347	134	1183	629	194	1713	911	254	2243	24	23	23	
15	132	070	75	662	352	135	1192	634	195	1722	915	255	2252	25	24	24	
16	141	075	76	671	357	136	1201	638	196	1731	920	256	2261	26	25	25	
17	150	080	77	680	361	137	1210	643	197	1739	925	257	2270	27	26	26	
18	159	085	78	689	366	138	1218	648	198	1748	930	258	2279	28	27	27	
19	168	089	79	698	371	139	1227	653	199	1757	934	259	2287	29	28	28	
20	177	094	80	706	376	140	1236	657	200	1766	939	260	2296	30	29	29	
21	185	099	81	715	380	141	1245	662	201	1775	944	261	2304	31	30	30	
22	194	103	82	724	385	142	1254	667	202	1784	948	262	2313	32	31	31	
23	203	108	83	733	390	143	1263	671	203	1793	953	263	2322	33	32	32	
24	212	113	84	742	394	144	1271	676	204	1801	958	264	2331	34	33	33	
25	221	117	85	751	399	145	1280	681	205	1810	962	265	2340	35	34	34	
26	230	122	86	759	404	146	1289	685	206	1819	967	266	2349	36	35	35	
27	239	127	87	768	408	147	1298	690	207	1828	972	267	2357	37	36	36	
28	247	131	88	777	413	148	1307	695	208	1837	977	268	2366	38	37	37	
29	256	136	89	786	418	149	1316	700	209	1845	981	269	2375	39	38	38	
30	265	141	90	795	423	150	1324	704	210	1854	986	270	2384	40	39	39	
31	274	146	91	803	427	151	1333	709	211	1863	991	271	2393	41	40	40	
32	283	150	92	812	432	152	1342	714	212	1872	995	272	2402	42	41	41	
33	291	155	93	821	437	153	1351	719	213	1881	1000	273	2410	43	42	42	
34	300	160	94	830	441	154	1360	723	214	1890	1005	274	2419	44	43	43	
35	309	164	95	839	446	155	1369	728	215	1899	1009	275	2428	45	44	44	
36	318	169	96	848	451	156	1377	732	216	1907	1014	276	2437	46	45	45	
37	327	174	97	856	456	157	1386	737	217	1916	1019	277	2446	47	46	46	
38	336	178	98	865	460	158	1395	742	218	1925	1023	278	2455	48	47	47	
39	344	183	99	874	465	159	1404	746	219	1934	1028	279	2464	49	48	48	
40	353	188	100	883	469	160	1413	751	220	1942	1033	280	2473	50	49	49	
41	362	192	101	892	474	161	1422	756	221	1951	1038	281	2481	51	50	50	
42	371	197	102	901	479	162	1430	761	222	1960	1042	282	2490	52	51	51	
43	380	202	103	909	484	163	1439	765	223	1969	1047	283	2499	53	52	52	
44	388	207	104	918	488	164	1448	770	224	1978	1052	284	2508	54	53	53	
45	397	211	105	927	493	165	1457	775	225	1987	1056	285	2517	55	54	54	
46	406	216	106	936	498	166	1466	779	226	1995	1061	286	2526	56	55	55	
47	415	221	107	945	502	167	1475	784	227	2004	1066	287	2534	57	56	56	
48	424	225	108	954	507	168	1483	789	228	2013	1070	288	2543	58	57	57	
49	433	230	109	962	512	169	1492	793	229	2022	1075	289	2552	59	58	58	
50	441	235	110	971	516	170	1501	798	230	2031	1080	290	2561	60	59	59	
51	450	239	111	980	521	171	1510	803	231	2040	1084	291	2569	61	60	60	
52	459	244	112	989	526	172	1519	807	232	2048	1089	292	2578	62	61	61	
53	468	249	113	998	531	173	1527	812	233	2057	1094	293	2587	63	62	62	
54	477	254	114	1007	536	174	1536	817	234	2066	1099	294	2596	64	63	63	
55	486	258	115	1015	540	175	1545	822	235	2075	1103	295	2605	65	64	64	
56	494	263	116	1024	545	176	1554	826	236	2084	1108	296	2614	66	65	65	
57	503	268	117	1033	549	177	1563	831	237	2093	1113	297	2623	67	66	66	
58	512	272	118	1042	554	178	1572	836	238	2101	1117	298	2632	68	67	67	
59	521	277	119	1051	559	179	1580	840	239	2110	1122	299	2641	69	68	68	
60	530	282	120	1060	563	180	1589	845	240	2119	1127	300	2649	70	69	69	
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 29 DEGREES.

69

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	009	005	61	53.4	29.6	121	105.8	58.7	181	158.3	87.8	241	210.8	116.8
2	017	010	62	54.2	30.1	122	106.7	59.1	182	159.2	88.2	242	211.7	117.3
3	026	015	63	55.1	30.5	123	107.6	59.6	183	160.1	88.7	243	212.5	117.8
4	035	019	64	56.0	31.0	124	108.5	60.1	184	160.9	89.2	244	213.4	118.3
5	044	024	65	56.9	31.5	125	109.3	60.6	185	161.8	89.7	245	214.3	118.8
6	052	029	66	57.7	32.0	126	110.2	61.1	186	162.7	90.2	246	215.2	119.3
7	061	034	67	58.6	32.5	127	111.1	61.6	187	163.6	90.7	247	216.0	119.7
8	070	039	68	59.5	33.0	128	112.0	62.1	188	164.4	91.1	248	216.9	120.2
9	079	044	69	60.3	33.5	129	112.8	62.5	189	165.3	91.6	249	217.8	120.7
10	087	048	70	61.2	33.9	130	113.7	63.0	190	166.2	92.1	250	218.7	121.2
11	096	053	71	62.1	34.4	131	114.6	63.5	191	167.1	92.6	251	219.5	121.7
12	105	058	72	63.0	34.9	132	115.4	64.0	192	167.9	93.1	252	220.4	122.2
13	114	063	73	63.8	35.4	133	116.3	64.5	193	168.8	93.6	253	221.3	122.7
14	122	068	74	64.7	35.9	134	117.2	65.0	194	169.7	94.1	254	222.2	123.1
15	131	073	75	65.6	36.4	135	118.1	65.4	195	170.6	94.5	255	223.0	123.6
16	140	078	76	66.5	36.8	136	118.9	65.9	196	171.4	95.0	256	223.9	124.1
17	149	082	77	67.3	37.3	137	119.8	66.4	197	172.3	95.5	257	224.8	124.6
18	157	087	78	68.2	37.8	138	120.7	66.9	198	173.2	96.0	258	225.7	125.1
19	166	092	79	69.1	38.3	139	121.6	67.4	199	174.0	96.5	259	226.5	125.6
20	175	097	80	70.0	38.8	140	122.4	67.9	200	174.9	97.0	260	227.4	126.1
21	184	102	81	70.8	39.3	141	123.3	68.4	201	175.8	97.4	261	228.3	126.6
22	192	107	82	71.7	39.8	142	124.2	68.8	202	176.7	97.9	262	229.2	127.0
23	201	112	83	72.6	40.2	143	125.1	69.3	203	177.5	98.4	263	230.0	127.5
24	210	116	84	73.5	40.7	144	125.9	69.8	204	178.4	98.9	264	230.9	128.0
25	219	121	85	74.3	41.2	145	126.8	70.3	205	179.3	99.4	265	231.8	128.5
26	227	126	86	75.2	41.7	146	127.7	70.8	206	180.2	99.9	266	232.6	129.0
27	236	134	87	76.1	42.2	147	128.6	71.3	207	181.0	100.4	267	233.5	129.4
28	245	136	88	77.0	42.7	148	129.4	71.8	208	181.9	100.8	268	234.4	129.9
29	254	141	89	77.8	43.1	149	130.3	72.2	209	182.8	101.3	269	235.3	130.4
30	262	145	90	78.7	43.6	150	131.2	72.7	210	183.7	101.8	270	236.1	130.9
31	271	150	91	79.6	44.1	151	132.1	73.2	211	184.5	102.3	271	237.0	131.4
32	280	155	92	80.5	44.6	152	132.9	73.7	212	185.4	102.8	272	237.9	131.9
33	289	160	93	81.3	45.1	153	133.8	74.2	213	186.3	103.3	273	238.8	132.4
34	297	165	94	82.2	45.6	154	134.7	74.7	214	187.2	103.7	274	239.6	132.8
35	306	170	95	83.1	46.1	155	135.6	75.1	215	188.0	104.2	275	240.5	133.3
36	315	175	96	84.0	46.5	156	136.4	75.6	216	188.9	104.7	276	241.4	133.8
37	324	179	97	84.8	47.0	157	137.3	76.1	217	189.8	105.2	277	242.3	134.3
38	332	184	98	85.7	47.5	158	138.2	76.6	218	190.7	105.7	278	243.1	134.8
39	341	189	99	86.6	48.0	159	139.1	77.1	219	191.5	106.2	279	244.0	135.3
40	350	194	100	87.5	48.5	160	139.9	77.6	220	192.4	106.7	280	244.9	135.7
41	359	199	101	88.3	49.0	161	140.8	78.1	221	193.3	107.1	281	245.8	136.2
42	367	204	102	89.2	49.5	162	141.7	78.5	222	194.2	107.6	282	246.6	136.7
43	376	208	103	90.1	49.9	163	142.6	79.0	223	195.0	108.1	283	247.5	137.2
44	385	213	104	91.0	50.4	164	143.4	79.5	224	195.9	108.6	284	248.4	137.7
45	394	218	105	91.8	50.9	165	144.3	80.0	225	196.8	109.1	285	249.3	138.2
46	402	223	106	92.7	51.4	166	145.2	80.5	226	197.7	109.6	286	250.1	138.7
47	411	228	107	93.6	51.9	167	146.1	81.0	227	198.5	110.1	287	251.0	139.1
48	420	233	108	94.5	52.4	168	146.9	81.4	228	199.4	110.5	288	251.9	139.6
49	429	238	109	95.3	52.8	169	147.8	81.9	229	200.3	111.0	289	252.8	140.1
50	437	242	110	96.2	53.3	170	148.7	82.4	230	201.2	111.5	290	253.6	140.6
51	446	247	111	97.1	53.8	171	149.6	82.9	231	202.0	112.0	291	254.5	141.1
52	455	252	112	98.0	54.3	172	150.4	83.4	232	202.9	112.5	292	255.4	141.6
53	464	257	113	98.8	54.8	173	151.3	83.9	233	203.8	113.0	293	256.3	142.0
54	472	262	114	99.7	55.3	174	152.2	84.4	234	204.7	113.4	294	257.1	142.5
55	481	267	115	100.6	55.8	175	153.1	84.8	235	205.5	113.9	295	258.0	143.0
56	490	271	116	101.5	56.2	176	153.9	85.3	236	206.4	114.4	296	258.9	143.5
57	499	276	117	102.3	56.7	177	154.8	85.8	237	207.3	114.9	297	259.8	144.0
58	507	281	118	103.2	57.2	178	155.7	86.3	238	208.2	115.4	298	260.6	144.6
59	516	286	119	104.1	57.7	179	156.6	86.8	239	209.0	115.9	299	261.5	145.0
60	525	291	120	105.0	58.2	180	157.4	87.3	240	209.9	116.4	300	262.4	145.4
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 61 DEGREES.

13	11-3	08-5	73	63-2	36-5	133	115-2	96-5	193	167-1	96-5	255
14	12-1	07-0	74	64-1	37-0	134	116-0	97-0	194	168-0	97-0	254
15	13-0	07-5	75	65-0	37-5	135	116-9	97-5	195	168-9	97-5	253
16	13-9	08-0	76	65-8	38-0	136	117-8	98-0	196	169-7	98-0	252
17	14-7	08-5	77	66-7	38-5	137	118-6	98-5	197	170-6	98-5	251
18	15-6	09-0	78	67-5	39-0	138	119-5	99-0	198	171-5	99-0	250
19	16-5	09-5	79	68-4	39-5	139	120-4	99-5	199	172-3	99-5	249
20	17-3	10-0	80	69-3	40-0	140	121-2	70-0	200	173-2	100-0	248
21	18-2	10-5	81	70-1	40-5	141	122-1	70-5	201	174-1	100-5	247
22	19-1	11-0	82	71-0	41-0	142	123-0	71-0	202	174-9	101-0	246
23	19-9	11-5	83	71-9	41-5	143	123-8	71-5	203	175-8	101-5	245
24	20-8	12-0	84	72-7	42-0	144	124-7	72-0	204	176-7	102-0	244
25	21-7	12-5	85	73-6	42-5	145	125-6	72-5	205	177-5	102-5	243
26	22-5	13-0	86	74-5	43-0	146	126-4	73-0	206	178-4	103-0	242
27	23-4	13-5	87	75-3	43-5	147	127-3	73-5	207	179-3	103-5	241
28	24-2	14-0	88	76-2	44-0	148	128-2	74-0	208	180-1	104-0	240
29	25-1	14-5	89	77-1	44-5	149	129-0	74-5	209	181-0	104-5	239
30	26-0	15-0	90	77-9	45-0	150	129-9	75-0	210	181-9	105-0	238
31	26-8	15-5	91	78-8	45-5	151	130-8	75-5	211	182-7	105-5	237
32	27-7	16-0	92	79-7	46-0	152	131-6	76-0	212	183-6	106-0	236
33	28-6	16-5	93	80-5	46-5	153	132-5	76-5	213	184-5	106-5	235
34	29-4	17-0	94	81-4	47-0	154	133-4	77-0	214	185-3	107-0	234
35	30-3	17-5	95	82-3	47-5	155	134-2	77-5	215	186-2	107-5	233
36	31-2	18-0	96	83-1	48-0	156	135-1	78-0	216	187-1	108-0	232
37	32-0	18-5	97	84-0	48-5	157	136-0	78-5	217	187-9	108-5	231
38	32-9	19-0	98	84-9	49-0	158	136-8	79-0	218	188-8	109-0	230
39	33-8	19-5	99	85-7	49-5	159	137-7	79-5	219	189-7	109-5	229
40	34-6	20-0	100	86-6	50-0	160	138-6	80-0	220	190-5	110-0	228
41	35-5	20-5	101	87-5	50-5	161	139-4	80-5	221	191-4	110-5	227
42	36-4	21-0	102	88-3	51-0	162	140-3	81-0	222	192-3	111-0	226
43	37-2	21-5	103	89-2	51-5	163	141-2	81-5	223	193-1	111-5	225
44	38-1	22-0	104	90-1	52-0	164	142-0	82-0	224	194-0	112-0	224
45	39-0	22-5	105	90-9	52-5	165	142-9	82-5	225	194-9	112-5	223
46	39-8	23-0	106	91-8	53-0	166	143-8	83-0	226	195-7	113-0	222
47	40-7	23-5	107	92-7	53-5	167	144-6	83-5	227	196-6	113-5	221

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 31 DEGREES. 71

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°00'	00.0	61	52.3	31.4	121	103.7	62.3	181	155.1	93.2	241	209.6	124.1
2	01°01'	00.0	62	53.1	31.9	122	104.6	62.8	182	156.0	93.7	242	207.4	124.6
3	02°01'	00.5	63	54.0	32.4	123	105.4	63.3	183	156.9	94.3	243	208.3	125.2
4	03°04'	02.1	64	54.9	33.0	124	106.3	63.9	184	157.7	94.8	244	209.1	125.7
5	04°02'	02.6	65	55.7	33.5	125	107.1	64.4	185	158.6	95.3	245	210.0	126.2
6	05°03'	03.1	66	56.6	34.0	126	108.0	64.9	186	159.4	95.8	246	210.9	126.7
7	06°03'	03.6	67	57.4	34.5	127	108.9	65.4	187	160.3	96.3	247	211.7	127.2
8	06°09'	04.1	68	58.3	35.0	128	109.7	65.9	188	161.1	96.8	248	212.6	127.7
9	07°07'	04.6	69	59.1	35.5	129	110.6	66.4	189	162.0	97.3	249	213.4	128.2
10	08°06'	05.2	70	60.0	36.1	130	111.4	67.0	190	162.9	97.9	250	214.3	128.8
11	09°04'	05.7	71	60.9	36.6	131	112.3	67.5	191	163.7	98.4	251	215.1	129.3
12	10°03'	06.2	72	61.7	37.1	132	113.1	68.0	192	164.6	98.9	252	216.0	129.8
13	11°01'	06.7	73	62.6	37.6	133	114.0	68.5	193	165.4	99.4	253	216.9	130.3
14	12°00'	07.2	74	63.4	38.1	134	114.9	69.0	194	166.3	99.9	254	217.7	130.8
15	12°59'	07.7	75	64.3	38.6	135	115.7	69.5	195	167.1	100.4	255	218.6	131.3
16	13°57'	08.2	76	65.1	39.1	136	116.6	70.0	196	168.0	100.9	256	219.4	131.8
17	14°56'	08.8	77	66.0	39.7	137	117.4	70.6	197	168.9	101.5	257	220.3	132.4
18	15°54'	09.3	78	66.9	40.2	138	118.3	71.1	198	169.7	102.0	258	221.1	132.9
19	16°53'	09.8	79	67.7	40.7	139	119.1	71.6	199	170.6	102.5	259	222.0	133.4
20	17°51'	10.3	80	68.6	41.2	140	120.0	72.1	200	171.4	103.0	260	222.9	133.9
21	18°50'	10.8	81	69.4	41.7	141	120.9	72.6	201	172.3	103.5	261	223.7	134.4
22	18°59'	11.3	82	70.3	42.2	142	121.7	73.1	202	173.1	104.0	262	224.6	134.9
23	19°17'	11.8	83	71.1	42.7	143	122.6	73.7	203	174.0	104.6	263	225.4	135.5
24	20°16'	12.4	84	72.0	43.3	144	123.4	74.2	204	174.9	105.1	264	226.3	136.0
25	21°14'	12.9	85	72.9	43.8	145	124.3	74.7	205	175.7	105.6	265	227.1	136.5
26	22°13'	13.4	86	73.7	44.3	146	125.1	75.2	206	176.6	106.1	266	228.0	137.0
27	23°11'	13.9	87	74.6	44.8	147	126.0	75.7	207	177.4	106.6	267	228.9	137.5
28	24°10'	14.4	88	75.4	45.3	148	126.9	76.2	208	178.3	107.1	268	229.7	138.0
29	24°59'	14.9	89	76.3	45.8	149	127.7	76.7	209	179.1	107.6	269	230.6	138.5
30	25°57'	15.5	90	77.1	46.4	150	128.6	77.3	210	180.0	108.2	270	231.4	139.1
31	26°56'	16.0	91	78.0	46.6	151	129.4	77.8	211	180.9	108.7	271	232.3	139.6
32	27°54'	16.5	92	78.9	47.4	152	130.3	78.3	212	181.7	109.2	272	233.1	140.1
33	28°53'	17.0	93	79.7	47.9	153	131.1	78.8	213	182.6	109.7	273	234.0	140.6
34	29°51'	17.5	94	80.6	48.4	154	132.0	79.3	214	183.4	110.2	274	234.9	141.1
35	30°50'	18.0	95	81.4	48.9	155	132.9	79.8	215	184.3	110.7	275	235.7	141.6
36	30°59'	18.5	96	82.3	49.4	156	133.7	80.3	216	185.1	111.2	276	236.6	142.2
37	31°57'	19.1	97	83.1	50.0	157	134.6	80.9	217	186.0	111.8	277	237.4	142.7
38	32°56'	19.6	98	84.0	50.5	158	135.4	81.4	218	186.9	112.3	278	238.3	143.2
39	33°54'	20.1	99	84.9	51.0	159	136.3	81.9	219	187.7	112.8	279	239.1	143.7
40	34°53'	20.6	100	85.7	51.5	160	137.1	82.4	220	188.6	113.3	280	240.0	144.2
41	35°51'	21.1	101	86.6	52.0	161	138.0	82.9	221	189.4	113.8	281	240.9	144.7
42	36°50'	21.6	102	87.4	52.5	162	138.9	83.4	222	190.3	114.3	282	241.7	145.2
43	36°59'	22.1	103	88.3	53.0	163	139.7	84.0	223	191.1	114.9	283	242.6	145.8
44	37°57'	22.7	104	89.1	53.6	164	140.6	84.5	224	192.0	115.4	284	243.4	146.3
45	38°56'	23.2	105	90.0	54.1	165	141.4	85.0	225	192.9	115.9	285	244.3	146.8
46	39°54'	23.7	106	90.9	54.6	166	142.3	85.5	226	193.7	116.4	286	245.1	147.3
47	40°53'	24.2	107	91.7	55.1	167	143.1	86.0	227	194.6	116.9	287	246.0	147.8
48	41°51'	24.7	108	92.6	55.6	168	144.0	86.5	228	195.4	117.4	288	246.9	148.3
49	42°50'	25.2	109	93.4	56.1	169	144.9	87.0	229	196.3	117.9	289	247.7	148.8
50	43°49'	25.8	110	94.3	56.7	170	145.7	87.6	230	197.1	118.5	290	248.6	149.4
51	43°57'	26.3	111	95.1	57.2	171	146.6	88.1	231	198.0	119.0	291	249.4	149.9
52	44°56'	26.8	112	96.0	57.7	172	147.4	88.6	232	198.9	119.5	292	250.3	150.4
53	45°54'	27.3	113	96.9	58.2	173	148.3	89.1	233	199.7	120.0	293	251.1	150.9
54	46°53'	27.8	114	97.7	58.7	174	149.1	89.6	234	200.6	120.5	294	252.0	151.4
55	47°51'	28.3	115	98.6	59.2	175	150.0	90.1	235	201.4	121.0	295	252.9	151.9
56	48°50'	28.8	116	99.4	59.7	176	150.9	90.6	236	202.3	121.5	296	253.7	152.5
57	48°59'	29.4	117	100.3	60.3	177	151.7	91.2	237	203.1	122.1	297	254.6	153.0
58	49°57'	29.9	118	101.1	60.8	178	152.6	91.7	238	204.0	122.6	298	255.4	153.5
59	50°56'	30.4	119	102.0	61.3	179	153.4	92.2	239	204.9	123.1	299	256.3	154.0
60	51°54'	30.9	120	102.9	61.8	180	154.3	92.7	240	205.7	123.6	300	257.1	154.5

FOR 59 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°5	00'5	61	51'7	32'3	121	102°6	64'1	181	153°5	95°9	241	204°4	137°7
2	01'7	01'1	62	52°6	32°9	122	103°5	64'7	182	154°3	96°4	242	205°2	138°2
3	02°5	01°6	63	53°4	33°4	123	104°3	65°2	183	155°2	97°0	243	206°1	138°8
4	03°4	02°1	64	54°3	33°9	124	105°2	65°7	184	156°0	97°5	244	206°9	139°3
5	04°2	02°6	65	55°1	34°4	125	106°0	66°2	185	156°9	98°0	245	207°8	139°8
6	05°1	03°2	66	56°0	35°0	126	106°9	66°8	186	157°7	98°6	246	208°6	140°4
7	05°9	03°7	67	56°8	35°5	127	107°7	67°3	187	158°6	99°1	247	209°5	140°9
8	06°8	04°2	68	57°7	36°0	128	108°6	67°8	188	159°4	99°6	248	210°3	141°4
9	07°6	04°8	69	58°5	36°6	129	109°4	68°4	189	160°3	100°2	249	211°2	141°9
10	08°5	05°3	70	59°4	37°1	130	110°2	68°9	190	161°1	100°7	250	212°0	142°5
11	09°3	05°8	71	60°2	37°6	131	111°1	69°4	191	162°0	101°2	251	212°9	143°0
12	10°2	06°4	72	61°1	38°2	132	111°9	69°9	192	162°8	101°7	252	213°7	143°5
13	11°0	06°9	73	61°9	38°7	133	112°8	70°5	193	163°7	102°3	253	214°6	144°1
14	11°9	07°4	74	62°8	39°2	134	113°6	71°0	194	164°5	102°8	254	215°4	144°6
15	12°7	07°9	75	63°6	39°7	135	114°5	71°5	195	165°4	103°3	255	216°3	145°1
16	13°6	08°5	76	64°5	40°3	136	115°3	72°1	196	166°2	103°9	256	217°1	145°6
17	14°4	09°0	77	65°3	40°8	137	116°2	72°6	197	167°1	104°4	257	217°9	146°1
18	15°3	09°5	78	66°1	41°3	138	117°0	73°1	198	167°9	104°9	258	218°8	146°6
19	16°1	10°1	79	67°0	41°9	139	117°9	73°7	199	168°8	105°5	259	219°6	147°1
20	17°0	10°6	80	67°8	42°4	140	118°7	74°2	200	169°6	106°0	260	220°5	147°6
21	17°8	11°1	81	68°7	42°9	141	119°6	74°7	201	170°5	106°5	261	221°3	148°1
22	18°7	11°7	82	69°5	43°5	142	120°4	75°2	202	171°3	107°0	262	222°2	148°6
23	19°5	12°2	83	70°4	44°0	143	121°3	75°8	203	172°2	107°6	263	223°0	149°1
24	20°4	12°7	84	71°2	44°5	144	122°1	76°3	204	173°0	108°1	264	223°9	149°6
25	21°2	13°2	85	72°1	45°0	145	123°0	76°8	205	173°8	108°6	265	224°7	150°1
26	22°0	13°8	86	72°9	45°6	146	123°8	77°4	206	174°7	109°2	266	225°6	150°6
27	22°9	14°3	87	73°8	46°1	147	124°7	77°9	207	175°5	109°7	267	226°4	151°1
28	23°7	14°8	88	74°6	46°6	148	125°5	78°4	208	176°4	110°2	268	227°3	151°6
29	24°6	15°4	89	75°5	47°2	149	126°4	79°0	209	177°2	110°8	269	228°1	152°1
30	25°4	15°9	90	76°3	47°7	150	127°2	79°5	210	178°1	111°3	270	229°0	152°6
31	26°3	16°4	91	77°2	48°2	151	128°1	80°0	211	178°9	111°8	271	229°8	153°1
32	27°1	17°0	92	78°0	48°8	152	128°9	80°5	212	179°8	112°3	272	230°7	153°6
33	28°0	17°5	93	78°9	49°3	153	129°8	81°1	213	180°6	112°9	273	231°5	154°1
34	28°8	18°0	94	79°7	49°8	154	130°6	81°6	214	181°5	113°4	274	232°4	154°6
35	29°7	18°5	95	80°6	50°3	155	131°4	82°1	215	182°3	113°9	275	233°2	155°1
36	30°5	19°1	96	81°4	50°9	156	132°3	82°7	216	183°2	114°5	276	234°1	155°6
37	31°4	19°6	97	82°3	51°4	157	133°1	83°2	217	184°0	115°0	277	234°9	156°1
38	32°2	20°1	98	83°1	51°9	158	134°0	83°7	218	184°9	115°5	278	235°8	156°6
39	33°1	20°7	99	84°0	52°5	159	134°8	84°3	219	185°7	116°1	279	236°6	157°1
40	33°9	21°2	100	84°8	53°0	160	135°7	84°8	220	186°6	116°6	280	237°5	157°6
41	34°8	21°7	101	85°7	53°5	161	136°5	85°3	221	187°4	117°1	281	238°3	158°1
42	35°6	22°3	102	86°5	54°1	162	137°4	85°8	222	188°3	117°6	282	239°1	158°6
43	36°5	22°8	103	87°3	54°6	163	138°2	86°4	223	189°1	118°2	283	240°0	159°1
44	37°3	23°3	104	88°2	55°1	164	139°1	86°9	224	190°0	118°7	284	240°8	159°6
45	38°2	23°8	105	89°0	55°6	165	139°9	87°4	225	190°8	119°2	285	241°7	160°1
46	39°0	24°4	106	89°9	56°2	166	140°8	88°0	226	191°7	119°8	286	242°5	160°6
47	39°9	24°9	107	90°7	56°7	167	141°6	88°5	227	192°5	120°3	287	243°4	161°1
48	40°7	25°4	108	91°6	57°2	168	142°5	89°0	228	193°4	120°8	288	244°2	161°6
49	41°6	26°0	109	92°4	57°8	169	143°3	89°6	229	194°2	121°4	289	245°1	162°1
50	42°4	26°5	110	93°3	58°3	170	144°2	90°1	230	195°1	121°9	290	245°9	162°6
51	43°3	27°0	111	94°1	58°8	171	145°0	90°6	231	195°9	122°4	291	246°8	163°1
52	44°1	27°6	112	95°0	59°4	172	145°9	91°1	232	196°7	122°9	292	247°6	163°6
53	44°9	28°1	113	95°8	59°9	173	146°7	91°7	233	197°6	123°5	293	248°5	164°1
54	45°8	28°6	114	96°7	60°4	174	147°6	92°2	234	198°4	124°0	294	249°3	164°6
55	46°6	29°1	115	97°5	60°9	175	148°4	92°7	235	199°3	124°5	295	250°2	165°1
56	47°5	29°7	116	98°4	61°5	176	149°3	93°3	236	200°1	125°1	296	251°0	165°6
57	48°3	30°2	117	99°2	62°0	177	150°1	93°8	237	201°0	125°6	297	251°9	166°1
58	49°2	30°7	118	100°1	62°5	178	151°0	94°3	238	201°8	126°1	298	252°7	166°6
59	50°0	31°3	119	100°9	63°1	179	151°8	94°9	239	202°7	126°7	299	253°6	167°1
60	50°9	31°8	120	101°8	63°6	180	152°6	95°4	240	203°5	127°2	300	254°4	167°6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 33 DEGREES. 73

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00-8	00-5	61	51-2	33-2	121	101-5	65-9	181	151-8	98-6	241	302-1	131-3
2	01-7	01-1	62	52-0	33-8	122	102-3	66-4	182	152-6	99-1	242	303-0	131-6
3	02-5	01-6	63	52-8	34-3	123	103-2	67-0	183	153-5	99-7	243	303-8	132-3
4	03-4	02-2	64	53-7	34-9	124	104-0	67-5	184	154-3	100-2	244	304-6	132-9
5	04-2	02-7	65	54-5	35-4	125	104-8	68-1	185	155-2	100-8	245	305-5	133-4
6	05-0	03-3	66	55-4	35-9	126	105-7	68-6	186	156-0	101-3	246	306-3	134-0
7	05-9	03-8	67	56-2	36-5	127	106-5	69-2	187	156-8	101-8	247	307-2	134-5
8	06-7	04-4	68	57-0	37-0	128	107-3	69-7	188	157-7	102-4	248	308-0	135-1
9	07-5	04-9	69	57-9	37-6	129	108-2	70-3	189	158-5	102-9	249	308-8	135-6
10	08-4	05-4	70	58-7	38-1	130	109-0	70-8	190	159-3	103-5	250	309-7	136-2
11	09-2	06-0	71	59-5	38-7	131	109-9	71-3	191	160-2	104-0	251	310-5	136-7
12	10-1	06-5	72	60-4	39-2	132	110-7	71-9	192	161-0	104-6	252	311-3	137-2
13	10-9	07-1	73	61-2	39-8	133	111-5	72-4	193	161-9	105-1	253	312-2	137-6
14	11-7	07-6	74	62-1	40-3	134	112-4	73-0	194	162-7	105-7	254	313-0	138-3
15	12-6	08-2	75	62-9	40-8	135	113-2	73-5	195	163-5	106-2	255	313-9	138-9
16	13-4	08-7	76	63-7	41-4	136	114-1	74-1	196	164-4	106-7	256	314-7	139-4
17	14-3	09-3	77	64-5	41-9	137	114-9	74-6	197	165-2	107-3	257	315-5	140-0
18	15-1	09-8	78	65-4	42-5	138	115-7	75-2	198	166-1	107-8	258	316-4	140-5
19	15-9	10-3	79	66-3	43-0	139	116-6	75-7	199	166-9	108-4	259	317-2	141-1
20	16-8	10-9	80	67-1	43-6	140	117-4	76-2	200	167-7	108-9	260	318-1	141-6
21	17-6	11-4	81	67-9	44-1	141	118-3	76-8	201	168-6	109-5	261	318-9	142-2
22	18-5	12-0	82	68-8	44-7	142	119-1	77-3	202	169-4	110-0	262	319-7	142-7
23	19-3	12-5	83	69-6	45-2	143	119-9	77-9	203	170-3	110-6	263	320-6	143-2
24	20-1	13-1	84	70-4	45-7	144	120-8	78-4	204	171-1	111-1	264	321-4	143-8
25	21-0	13-6	85	71-3	46-3	145	121-6	79-0	205	171-9	111-7	265	322-2	144-3
26	21-8	14-2	86	72-1	46-8	146	122-4	79-5	206	172-8	112-2	266	323-1	144-9
27	22-6	14-7	87	73-0	47-4	147	123-3	80-1	207	173-6	112-7	267	323-9	145-4
28	23-5	15-2	88	73-8	47-9	148	124-1	80-6	208	174-4	113-3	268	324-8	146-0
29	24-3	15-8	89	74-6	48-5	149	125-0	81-2	209	175-3	113-8	269	325-6	146-5
30	25-2	16-3	90	75-5	49-0	150	125-8	81-7	210	176-1	114-4	270	326-4	147-1
31	26-0	16-9	91	76-3	49-6	151	126-6	82-2	211	177-0	114-9	271	327-3	147-6
32	26-8	17-4	92	77-2	50-1	152	127-5	82-8	212	177-8	115-5	272	328-1	148-1
33	27-7	18-0	93	78-0	50-7	153	128-3	83-3	213	178-6	116-0	273	329-0	148-7
34	28-5	18-5	94	78-8	51-2	154	129-2	83-9	214	179-5	116-6	274	329-8	149-2
35	29-4	19-1	95	79-7	51-7	155	130-0	84-4	215	180-3	117-1	275	330-6	149-8
36	30-2	19-6	96	80-5	52-3	156	130-8	85-0	216	181-2	117-6	276	331-5	150-3
37	31-0	20-2	97	81-4	52-8	157	131-7	85-5	217	182-0	118-2	277	332-3	150-9
38	31-9	20-7	98	82-2	53-4	158	132-5	86-1	218	182-8	118-7	278	333-2	151-4
39	32-7	21-2	99	83-0	53-9	159	133-3	86-6	219	183-7	119-3	279	334-0	152-0
40	33-5	21-8	100	83-9	54-5	160	134-2	87-1	220	184-5	119-8	280	334-8	152-5
41	34-4	22-3	101	84-7	55-0	161	135-0	87-7	221	185-3	120-4	281	335-7	153-0
42	35-2	22-9	102	85-5	55-6	162	135-9	88-2	222	186-2	120-9	282	336-5	153-6
43	36-1	23-4	103	86-4	56-1	163	136-7	88-8	223	187-0	121-5	283	337-3	154-1
44	36-9	24-0	104	87-2	56-6	164	137-5	89-3	224	187-9	122-0	284	338-2	154-7
45	37-7	24-5	105	88-1	57-2	165	138-4	89-9	225	188-7	122-5	285	339-0	155-2
46	38-6	25-1	106	88-9	57-7	166	139-2	90-4	226	189-5	123-1	286	339-9	155-8
47	39-4	25-6	107	89-7	58-3	167	140-1	91-0	227	190-4	123-6	287	340-7	156-3
48	40-3	26-1	108	90-6	58-8	168	140-9	91-5	228	191-2	124-2	288	341-5	156-9
49	41-1	26-7	109	91-4	59-4	169	141-7	92-0	229	192-1	124-7	289	342-4	157-4
50	41-9	27-2	110	92-3	59-9	170	142-6	92-6	230	192-9	125-3	290	343-2	157-9
51	42-8	27-8	111	93-1	60-5	171	143-4	93-1	231	193-7	125-8	291	344-1	158-5
52	43-6	28-3	112	93-9	61-0	172	144-3	93-7	232	194-6	126-4	292	344-9	159-0
53	44-4	28-9	113	94-8	61-5	173	145-1	94-2	233	195-4	126-9	293	345-7	159-6
54	45-3	29-4	114	95-6	62-1	174	145-9	94-8	234	196-2	127-4	294	346-6	160-1
55	46-1	30-0	115	96-4	62-6	175	146-8	95-3	235	197-1	128-0	295	347-4	160-7
56	47-0	30-5	116	97-3	63-2	176	147-6	95-9	236	197-9	128-5	296	348-2	161-2
57	47-8	31-0	117	98-1	63-7	177	148-4	96-4	237	198-8	129-1	297	349-1	161-8
58	48-6	31-6	118	99-0	64-3	178	149-3	96-9	238	199-6	129-6	298	349-9	162-3
59	49-5	32-1	119	99-8	64-8	179	150-1	97-5	239	200-4	130-2	299	350-8	162-8
60	50-3	32-7	120	100-6	65-4	180	151-0	98-0	240	201-3	130-7	300	351-6	163-4
Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.

FOR 57 DEGREES.

12	09.9	06.7	72	59.7	40.3	132	109.4	73.8	192	159.2	107.4
13	10.8	07.3	73	60.5	40.8	133	110.3	74.4	193	160.0	107.9
14	11.6	07.8	74	61.3	41.4	134	111.1	74.9	194	160.8	108.5
15	12.4	08.4	75	62.2	41.9	135	111.9	75.5	195	161.7	109.0
16	13.3	08.9	76	63.0	42.5	136	112.7	76.1	196	162.5	109.6
17	14.1	09.5	77	63.8	43.1	137	113.6	76.6	197	163.3	110.2
18	14.9	10.1	78	64.7	43.6	138	114.4	77.2	198	164.1	110.7
19	15.8	10.6	79	65.5	44.2	139	115.2	77.7	199	165.0	111.3
20	16.6	11.2	80	66.3	44.7	140	116.1	78.3	200	165.8	111.8
21	17.4	11.7	81	67.2	45.3	141	116.9	78.8	201	166.6	112.4
22	18.2	12.3	82	68.0	45.9	142	117.7	79.4	202	167.5	113.0
23	19.1	12.9	83	68.8	46.4	143	118.6	80.0	203	168.3	113.5
24	19.9	13.4	84	69.6	47.0	144	119.4	80.5	204	169.1	114.1
25	20.7	14.0	85	70.5	47.5	145	120.2	81.1	205	170.0	114.6
26	21.6	14.5	86	71.3	48.1	146	121.0	81.6	206	170.8	115.2
27	22.4	15.1	87	72.1	48.6	147	121.9	82.2	207	171.6	115.8
28	23.2	15.7	88	73.0	49.2	148	122.7	82.8	208	172.4	116.3
29	24.0	16.2	89	73.8	49.8	149	123.5	83.3	209	173.3	116.9
30	24.9	16.8	90	74.6	50.3	150	124.4	83.9	210	174.1	117.4
31	25.7	17.3	91	75.4	50.9	151	125.2	84.4	211	174.9	118.0
32	26.5	17.9	92	76.3	51.4	152	126.0	85.0	212	175.8	118.5
33	27.4	18.5	93	77.1	52.0	153	126.8	85.6	213	176.6	119.1
34	28.2	19.0	94	77.9	52.6	154	127.7	86.1	214	177.4	119.7
35	29.0	19.6	95	78.8	53.1	155	128.5	86.7	215	178.2	120.2
36	29.8	20.1	96	79.6	53.7	156	129.3	87.2	216	179.1	120.8
37	30.7	20.7	97	80.4	54.2	157	130.2	87.8	217	179.9	121.3
38	31.5	21.2	98	81.2	54.8	158	131.0	88.4	218	180.7	121.9
39	32.3	21.8	99	82.1	55.4	159	131.8	88.9	219	181.6	122.5
40	33.2	22.4	100	82.9	55.9	160	132.6	89.5	220	182.4	123.0
41	34.0	22.9	101	83.7	56.5	161	133.5	90.0	221	183.2	123.6
42	34.8	23.5	102	84.6	57.0	162	134.3	90.6	222	184.0	124.1
43	35.6	24.0	103	85.4	57.6	163	135.1	91.1	223	184.9	124.7
44	36.5	24.6	104	86.2	58.2	164	136.0	91.7	224	185.7	125.3
45	37.3	25.2	105	87.0	58.7	165	136.8	92.3	225	186.5	125.8
46	38.1	25.7	106	87.9	59.3	166	137.6	92.8	226	187.4	126.4

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 35 DEGREES.

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Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	008	006	81	500	350	121	99.1	69.4	181	148.3	103.8	241	197.4	138.2
2	016	011	82	508	356	122	99.9	70.0	182	149.1	104.4	242	198.2	138.8
3	025	017	83	516	361	123	100.8	70.5	183	149.9	105.0	243	199.1	139.4
4	033	023	84	524	367	124	101.6	71.1	184	150.7	105.5	244	199.9	140.0
5	041	029	85	532	373	125	102.4	71.7	185	151.5	106.1	245	200.7	140.5
6	049	034	86	541	379	126	103.2	72.3	186	152.4	106.7	246	201.5	141.1
7	057	040	87	549	384	127	104.0	72.8	187	153.2	107.3	247	202.3	141.7
8	066	046	88	557	390	128	104.9	73.4	188	154.0	107.8	248	203.1	142.2
9	074	052	89	565	396	129	105.7	74.0	189	154.8	108.4	249	204.0	142.8
10	082	057	90	573	402	130	106.5	74.6	190	155.6	109.0	250	204.8	143.4
11	090	063	91	582	407	131	107.3	75.1	191	156.5	109.6	251	205.6	144.0
12	098	069	92	590	413	132	108.1	75.7	192	157.3	110.1	252	206.4	144.5
13	106	075	93	598	419	133	108.9	76.3	193	158.1	110.7	253	207.2	145.1
14	115	080	94	606	424	134	109.8	76.9	194	158.9	111.3	254	208.1	145.7
15	123	086	95	614	430	135	110.6	77.4	195	159.7	111.8	255	208.9	146.3
16	131	092	96	622	436	136	111.4	78.0	196	160.6	112.4	256	209.7	146.8
17	139	098	97	631	442	137	112.2	78.6	197	161.4	113.0	257	210.5	147.4
18	147	103	98	639	447	138	113.0	79.2	198	162.2	113.6	258	211.3	148.0
19	156	109	99	647	453	139	113.9	79.7	199	163.0	114.1	259	212.2	148.6
20	164	115	100	655	459	140	114.7	80.3	200	163.8	114.7	260	213.0	149.1
21	172	120	81	664	465	141	115.5	80.9	201	164.6	115.3	261	213.8	149.7
22	180	126	82	672	470	142	116.3	81.4	202	165.5	115.9	262	214.6	150.3
23	188	132	83	680	476	143	117.1	82.0	203	166.3	116.4	263	215.4	150.9
24	197	138	84	688	482	144	118.0	82.6	204	167.1	117.0	264	216.3	151.4
25	205	143	85	696	488	145	118.8	83.2	205	167.9	117.6	265	217.1	152.0
26	213	149	86	704	493	146	119.6	83.7	206	168.7	118.2	266	217.9	152.6
27	221	155	87	713	499	147	120.4	84.3	207	169.6	118.7	267	218.7	153.1
28	229	161	88	721	505	148	121.2	84.9	208	170.4	119.3	268	219.5	153.7
29	238	166	89	729	510	149	122.1	85.5	209	171.2	119.9	269	220.4	154.3
30	246	172	90	737	516	150	122.9	86.0	210	172.0	120.5	270	221.2	154.9
31	254	178	91	745	522	151	123.7	86.6	211	172.8	121.0	271	222.0	155.4
32	262	184	92	754	528	152	124.5	87.2	212	173.7	121.6	272	222.8	156.0
33	270	189	93	762	533	153	125.3	87.8	213	174.5	122.2	273	223.6	156.6
34	279	195	94	770	539	154	126.1	88.3	214	175.3	122.7	274	224.4	157.2
35	287	201	95	778	545	155	127.0	88.9	215	176.1	123.3	275	225.3	157.7
36	295	206	96	786	551	156	127.8	89.5	216	176.9	123.9	276	226.1	158.3
37	303	212	97	795	556	157	128.6	90.1	217	177.8	124.5	277	226.9	158.9
38	311	218	98	803	562	158	129.4	90.6	218	178.6	125.0	278	227.7	159.5
39	319	224	99	811	568	159	130.2	91.2	219	179.4	125.6	279	228.5	160.0
40	328	229	100	819	574	160	131.1	91.8	220	180.2	126.2	280	229.4	160.6
41	336	235	101	827	579	161	131.9	92.3	221	181.0	126.8	281	230.2	161.2
42	344	241	102	836	585	162	132.7	92.9	222	181.9	127.3	282	231.0	161.7
43	352	247	103	844	591	163	133.5	93.5	223	182.7	127.9	283	231.8	162.3
44	360	252	104	852	597	164	134.3	94.1	224	183.5	128.5	284	232.6	162.9
45	369	258	105	860	602	165	135.2	94.6	225	184.3	129.1	285	233.5	163.5
46	377	264	106	868	608	166	136.0	95.2	226	185.1	129.6	286	234.3	164.0
47	385	270	107	876	614	167	136.8	95.8	227	185.9	130.2	287	235.1	164.6
48	393	276	108	885	619	168	137.6	96.4	228	186.8	130.8	288	235.9	165.2
49	401	281	109	893	625	169	138.4	96.9	229	187.6	131.3	289	236.7	165.8
50	410	287	110	901	631	170	139.3	97.5	230	188.4	131.9	290	237.6	166.3
51	418	293	111	909	637	171	140.1	98.1	231	189.2	132.5	291	238.4	166.9
52	426	298	112	917	642	172	140.9	98.7	232	190.0	133.1	292	239.2	167.5
53	434	304	113	926	648	173	141.7	99.2	233	190.9	133.6	293	240.0	168.1
54	442	310	114	934	654	174	142.5	99.8	234	191.7	134.2	294	240.8	168.6
55	451	315	115	942	660	175	143.4	100.4	235	192.5	134.8	295	241.6	169.2
56	459	321	116	950	666	176	144.2	100.9	236	193.3	135.4	296	242.5	169.8
57	467	327	117	958	671	177	145.0	101.5	237	194.1	135.9	297	243.3	170.4
58	475	333	118	967	677	178	145.8	102.1	238	195.0	136.5	298	244.1	170.9
59	483	339	119	975	683	179	146.6	102.7	239	195.8	137.1	299	244.9	171.5
60	491	344	120	983	688	180	147.4	103.2	240	196.6	137.7	300	245.7	172.1

FOR 55 DEGREES.

E 2

13	10-8	07-3	73	60-5	40-8	133	110-3	74-4	193	160-0	1
14	11-6	07-8	74	61-3	41-4	134	111-1	74-9	194	160-8	1
15	12-4	08-4	75	62-2	41-9	135	111-9	75-5	195	161-7	1
16	13-3	08-9	76	63-0	42-5	138	112-7	76-1	196	162-5	1
17	14-1	09-5	77	63-8	43-1	137	113-6	76-6	197	163-3	1
18	14-9	10-1	78	64-7	43-6	138	114-4	77-2	198	164-1	1
19	15-8	10-6	79	65-5	44-2	139	115-2	77-7	199	165-0	1
20	16-6	11-2	80	66-3	44-7	140	116-1	78-3	200	165-8	1
21	17-4	11-7	81	67-2	45-3	141	116-9	78-8	201	166-6	1
22	18-2	12-3	82	68-0	45-9	142	117-7	79-4	202	167-5	1
23	19-1	12-9	83	68-8	46-4	143	118-6	80-0	203	168-3	1
24	19-9	13-4	84	69-6	47-0	144	119-4	80-5	204	169-1	1
25	20-7	14-0	85	70-5	47-5	145	120-2	81-1	205	170-0	1
26	21-6	14-5	86	71-3	48-1	146	121-0	81-6	206	170-8	1
27	22-4	15-1	87	72-1	48-6	147	121-9	82-2	207	171-6	1
28	23-2	15-7	88	73-0	49-2	148	122-7	82-8	208	172-4	1
29	24-0	16-2	89	73-8	49-8	149	123-5	83-3	209	173-3	1
30	24-9	16-8	90	74-6	50-3	150	124-4	83-9	210	174-1	1
31	25-7	17-3	91	75-4	50-9	151	125-2	84-4	211	174-9	1
32	26-5	17-9	92	76-3	51-4	152	126-0	85-0	212	175-8	1
33	27-4	18-5	93	77-1	52-0	153	126-8	85-6	213	176-6	1
34	28-2	19-0	94	77-9	52-6	154	127-7	86-1	214	177-4	1
35	29-0	19-6	95	78-8	53-1	155	128-5	86-7	215	178-2	1
36	29-8	20-1	96	79-6	53-7	156	129-3	87-2	216	179-1	1
37	30-7	20-7	97	80-4	54-2	157	130-2	87-8	217	179-9	1
38	31-5	21-2	98	81-2	54-8	158	131-0	88-4	218	180-7	1
39	32-3	21-8	99	82-1	55-4	159	131-8	88-9	219	181-6	1
40	33-2	22-4	100	82-9	55-9	160	132-6	89-5	220	182-4	1
41	34-0	22-9	101	83-7	56-5	161	133-5	90-0	221	183-2	1
42	34-8	23-5	102	84-6	57-0	162	134-3	90-6	222	184-0	1
43	35-6	24-0	103	85-4	57-6	163	135-1	91-1	223	184-9	1
44	36-5	24-6	104	86-2	58-2	164	136-0	91-7	224	185-7	1
45	37-3	25-2	105	87-0	58-7	165	136-8	92-3	225	186-5	1
46	38-1	25-7	106	87-9	59-3	166	137-6	92-8	226	187-4	1
47	39-0	26-3	107	88-7	59-8	167	138-4	93-4	227	188-2	1

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 35 DEGREES. 75

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°8	00'6	61	50'0	35'0	121	99'1	69'4	181	148'3	103'8	241	197'4	138'2			
2	01'6	01'1	62	50'8	35'6	122	99'9	70'0	182	149'1	104'4	242	198'2	138'8			
3	02'5	01'7	63	51'6	36'1	123	100'8	70'5	183	149'9	105'0	243	199'1	139'4			
4	03'3	02'3	64	52'4	36'7	124	101'6	71'1	184	150'7	105'5	244	199'9	140'0			
5	04'1	02'9	65	53'2	37'3	125	102'4	71'7	185	151'5	106'1	245	200'7	140'5			
6	04'9	03'4	66	54'1	37'9	126	103'2	72'3	186	152'4	106'7	246	201'5	141'1			
7	05'7	04'0	67	54'9	38'4	127	104'0	72'8	187	153'2	107'3	247	202'3	141'7			
8	06'6	04'6	68	55'7	39'0	128	104'9	73'4	188	154'0	107'8	248	203'1	142'2			
9	07'4	05'2	69	56'5	39'6	129	105'7	74'0	189	154'8	108'4	249	204'0	142'8			
10	08'2	05'7	70	57'3	40'2	130	106'5	74'6	190	155'6	109'0	250	204'8	143'4			
11	09'0	06'3	71	58'2	40'7	131	107'3	75'1	191	156'5	109'6	251	205'6	144'0			
12	09'8	06'9	72	59'0	41'3	132	108'1	75'7	192	157'3	110'1	252	206'4	144'5			
13	10'6	07'5	73	59'8	41'9	133	108'9	76'3	193	158'1	110'7	253	207'2	145'1			
14	11'5	08'0	74	60'6	42'4	134	109'8	76'9	194	158'9	111'3	254	208'1	145'7			
15	12'3	08'6	75	61'4	43'0	135	110'6	77'4	195	159'7	111'8	255	208'9	146'3			
16	13'1	09'2	76	62'3	43'6	136	111'4	78'0	196	160'6	112'4	256	209'7	146'8			
17	13'9	09'8	77	63'1	44'2	137	112'2	78'6	197	161'4	113'0	257	210'5	147'4			
18	14'7	10'3	78	63'9	44'7	138	113'0	79'2	198	162'2	113'6	258	211'3	148'0			
19	15'6	10'9	79	64'7	45'3	139	113'9	79'7	199	163'0	114'1	259	212'2	148'6			
20	16'4	11'5	80	65'5	45'9	140	114'7	80'3	200	163'8	114'7	260	213'0	149'1			
21	17'2	12'0	81	66'4	46'5	141	115'5	80'9	201	164'6	115'3	261	213'8	149'7			
22	18'0	12'6	82	67'2	47'0	142	116'3	81'4	202	165'5	115'9	262	214'6	150'3			
23	18'8	13'2	83	68'0	47'6	143	117'1	82'0	203	166'3	116'4	263	215'4	150'9			
24	19'7	13'8	84	68'8	48'2	144	118'0	82'6	204	167'1	117'0	264	216'3	151'4			
25	20'5	14'3	85	69'6	48'8	145	118'8	83'2	205	167'9	117'6	265	217'1	152'0			
26	21'3	14'9	86	70'4	49'3	146	119'6	83'7	206	168'7	118'2	266	217'9	152'6			
27	22'1	15'5	87	71'3	49'9	147	120'4	84'3	207	169'6	118'7	267	218'7	153'1			
28	22'9	16'1	88	72'1	50'5	148	121'2	84'9	208	170'4	119'3	268	219'5	153'7			
29	23'8	16'6	89	72'9	51'0	149	122'1	85'5	209	171'2	119'9	269	220'4	154'3			
30	24'6	17'2	90	73'7	51'6	150	122'9	86'0	210	172'0	120'5	270	221'2	154'9			
31	25'4	17'8	91	74'5	52'2	151	123'7	86'6	211	172'8	121'0	271	222'0	155'4			
32	26'2	18'4	92	75'4	52'8	152	124'5	87'2	212	173'7	121'6	272	222'8	156'0			
33	27'0	18'9	93	76'2	53'3	153	125'3	87'8	213	174'5	122'2	273	223'6	156'6			
34	27'9	19'5	94	77'0	53'9	154	126'1	88'3	214	175'3	122'7	274	224'4	157'2			
35	28'7	20'1	95	77'8	54'5	155	127'0	88'9	215	176'1	123'3	275	225'3	157'7			
36	29'5	20'6	96	78'6	55'1	156	127'8	89'5	216	176'9	123'9	276	226'1	158'3			
37	30'3	21'2	97	79'5	55'6	157	128'6	90'1	217	177'8	124'5	277	226'9	158'9			
38	31'1	21'8	98	80'3	56'2	158	129'4	90'6	218	178'6	125'0	278	227'7	159'5			
39	31'9	22'4	99	81'1	56'8	159	130'2	91'2	219	179'4	125'6	279	228'5	160'0			
40	32'8	22'9	100	81'9	57'4	160	131'1	91'8	220	180'2	126'2	280	229'4	160'6			
41	33'6	23'5	101	82'7	57'9	161	131'9	92'3	221	181'0	126'8	281	230'2	161'2			
42	34'4	24'1	102	83'6	58'5	162	132'7	92'9	222	181'9	127'3	282	231'0	161'7			
43	35'2	24'7	103	84'4	59'1	163	133'5	93'5	223	182'7	127'9	283	231'8	162'3			
44	36'0	25'2	104	85'2	59'7	164	134'3	94'1	224	183'5	128'5	284	232'6	162'9			
45	36'9	25'8	105	86'0	60'2	165	135'2	94'6	225	184'3	129'1	285	233'5	163'5			
46	37'7	26'4	106	86'8	60'8	166	136'0	95'2	226	185'1	129'6	286	234'3	164'0			
47	38'5	27'0	107	87'6	61'4	167	136'8	95'8	227	185'9	130'2	287	235'1	164'6			
48	39'3	27'5	108	88'5	61'9	168	137'6	96'4	228	186'8	130'8	288	235'9	165'2			
49	40'1	28'1	109	89'3	62'5	169	138'4	96'9	229	187'6	131'3	289	236'7	165'8			
50	41'0	28'7	110	90'1	63'1	170	139'3	97'5	230	188'4	131'9	290	237'6	166'3			
51	41'8	29'3	111	90'9	63'7	171	140'1	98'1	231	189'2	132'5	291	238'4	166'9			
52	42'6	29'8	112	91'7	64'2	172	140'9	98'7	232	190'0	133'1	292	239'2	167'5			
53	43'4	30'4	113	92'6	64'8	173	141'7	99'2	233	190'9	133'6	293	240'0	168'1			
54	44'2	31'0	114	93'4	65'4	174	142'5	99'8	234	191'7	134'2	294	240'8	168'6			
55	45'1	31'5	115	94'2	66'0	175	143'4	100'4	235	192'5	134'8	295	241'6	169'2			
56	45'9	32'1	116	95'0	66'5	176	144'2	100'9	236	193'3	135'4	296	242'5	169'8			
57	46'7	32'7	117	95'8	67'1	177	145'0	101'5	237	194'1	135'9	297	243'3	170'4			
58	47'5	33'3	118	96'7	67'7	178	145'8	102'1	238	195'0	136'5	298	244'1	170'9			
59	48'3	33'8	119	97'5	68'3	179	146'6	102'7	239	195'8	137'1	299	244'9	171'5			
60	49'1	34'4	120	98'3	68'8	180	147'4	103'2	240	196'6	137'7	300	245'7	172'1			
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 55 DEGREES.

12	09-7	07-1	72	58-2	42-3	132	106-8	77-8	192	155-3	112-9
13	10-5	07-6	73	59-1	42-9	133	107-6	78-2	193	156-1	113-4
14	11-3	08-2	74	59-9	43-5	134	108-4	78-8	194	156-9	114-0
15	12-1	08-8	75	60-7	44-1	135	109-2	79-4	195	157-8	114-6
16	12-9	09-4	76	61-5	44-7	136	110-0	79-9	196	158-6	115-2
17	13-8	10-0	77	62-3	45-3	137	110-8	80-5	197	159-4	115-8
18	14-6	10-6	78	63-1	45-8	138	111-6	81-1	198	160-2	116-4
19	15-4	11-2	79	63-9	46-4	139	112-5	81-7	199	161-0	117-0
20	16-2	11-8	80	64-7	47-0	140	113-3	82-3	200	161-8	117-6
21	17-0	12-3	81	65-5	47-6	141	114-1	82-9	201	162-6	118-1
22	17-8	12-9	82	66-3	48-2	142	114-9	83-5	202	163-4	118-7
23	18-6	13-5	83	67-1	48-8	14	115-7	84-1	203	164-2	119-3
24	19-4	14-1	84	68-0	49-4	144	116-5	84-6	204	165-0	119-9
25	20-2	14-7	85	68-8	50-0	145	117-3	85-2	205	165-8	120-5
26	21-0	15-3	86	69-6	50-5	146	118-1	85-8	206	166-7	121-1
27	21-8	15-9	87	70-4	51-1	147	118-9	86-4	207	167-5	121-7
28	22-7	16-5	88	71-2	51-7	148	119-7	87-0	208	168-3	122-3
29	23-5	17-0	89	72-0	52-3	149	120-5	87-6	209	169-1	122-8
30	24-3	17-6	90	72-8	52-9	150	121-4	88-2	210	169-9	123-4
31	25-1	18-2	91	73-6	53-5	151	122-2	88-8	211	170-7	124-0
32	25-9	18-8	92	74-4	54-1	152	123-0	89-3	212	171-5	124-6
33	26-7	19-4	93	75-2	54-7	153	123-8	89-9	213	172-3	125-2
34	27-5	20-0	94	76-0	55-3	154	124-6	90-5	214	173-1	125-8
35	28-3	20-6	95	76-9	55-8	155	125-4	91-1	215	173-9	126-4
36	29-1	21-2	96	77-7	56-4	156	126-2	91-7	216	174-7	127-0
37	29-9	21-7	97	78-5	57-0	157	127-0	92-3	217	175-6	127-5
38	30-7	22-3	98	79-3	57-6	158	127-8	92-9	218	176-4	128-1
39	31-6	22-9	99	80-1	58-2	159	128-6	93-5	219	177-2	128-7
40	32-4	23-5	100	80-9	58-8	160	129-4	94-0	220	178-0	129-3
41	33-2	24-1	101	81-7	59-4	161	130-3	94-6	221	178-8	129-9
42	34-0	24-7	102	82-5	60-0	162	131-1	95-2	222	179-6	130-5
43	34-8	25-3	103	83-3	60-5	163	131-9	95-8	223	180-4	131-1
44	35-6	25-9	104	84-1	61-1	164	132-7	96-4	224	181-2	131-7
45	36-4	26-5	105	84-9	61-7	165	133-5	97-0	225	182-0	132-3

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 37 DEGREES.

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Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00°6'	00.6	61	48°7'	36.7	121	98°6'	72.8	181	144°6'	108.9	241	192°5'	145.0
2	01°6'	01.2	62	49°5'	37.3	122	97°4'	73.4	182	145°4'	109.5	242	193°3'	145.6
3	02°4'	01.8	63	50°3'	37.9	123	98°2'	74.0	183	146°2'	110.1	243	194°1'	146.2
4	03°2'	02.4	64	51°1'	38.5	124	99°0'	74.6	184	146°9'	110.7	244	194°9'	146.8
5	04°0'	03.0	65	51°9'	39.1	125	99°8'	75.2	185	147°7'	111.3	245	195°7'	147.4
6	04°8'	03.6	66	52°7'	39.7	126	100°6'	75.8	186	148°5'	111.9	246	196°5'	148.0
7	05°6'	04.2	67	53°5'	40.3	127	101°4'	76.4	187	149°3'	112.5	247	197°3'	148.6
8	06°4'	04.8	68	54°3'	40.9	128	102°2'	77.0	188	150°1'	113.1	248	198°1'	149.3
9	07°2'	05.4	69	55°1'	41.5	129	103°0'	77.6	189	150°9'	113.7	249	198°9'	149.9
10	08°0'	06.0	70	55°9'	42.1	130	103°8'	78.2	190	151°7'	114.3	250	199°7'	150.5
11	08°8'	06.6	71	56°7'	42.7	131	104°6'	78.8	191	152°5'	114.9	251	200°5'	151.1
12	09°6'	07.2	72	57°5'	43.3	132	105°4'	79.4	192	153°3'	115.5	252	201°3'	151.7
13	10°4'	07.8	73	58°3'	43.9	133	106°2'	80.0	193	154°1'	116.2	253	202°1'	152.3
14	11°2'	08.4	74	59°1'	44.5	134	107°0'	80.6	194	154°9'	116.8	254	202°9'	152.9
15	12°0'	09.0	75	59°9'	45.1	135	107°8'	81.2	195	155°7'	117.4	255	203°7'	153.5
16	12°8'	09.6	76	60°7'	45.7	136	108°6'	81.8	196	156°5'	118.0	256	204°5'	154.1
17	13°6'	10.2	77	61°5'	46.3	137	109°4'	82.4	197	157°3'	118.6	257	205°3'	154.7
18	14°4'	10.8	78	62°3'	46.9	138	110°2'	83.1	198	158°1'	119.2	258	206°0'	155.3
19	15°2'	11.4	79	63°1'	47.5	139	111°0'	83.7	199	158°9'	119.8	259	206°8'	155.9
20	16°0'	12.0	80	63°9'	48.1	140	111°8'	84.3	200	159°7'	120.4	260	207°6'	156.5
21	16°8'	12.6	81	64°7'	48.7	141	112°6'	84.9	201	160°5'	121.0	261	208°4'	157.1
22	17°6'	13.2	82	65°5'	49.3	142	113°4'	85.5	202	161°3'	121.6	262	209°2'	157.7
23	18°4'	13.8	83	66°3'	50.0	143	114°2'	86.1	203	162°1'	122.2	263	210°0'	158.3
24	19°2'	14.4	84	67°1'	50.6	144	115°0'	86.7	204	162°9'	122.8	264	210°8'	158.9
25	20°0'	15.0	85	67°9'	51.2	145	115°8'	87.3	205	163°7'	123.4	265	211°6'	159.5
26	20°8'	15.6	86	68°7'	51.8	146	116°6'	87.9	206	164°5'	124.0	266	212°4'	160.1
27	21°6'	16.2	87	69°5'	52.4	147	117°4'	88.5	207	165°3'	124.6	267	213°2'	160.7
28	22°4'	16.8	88	70°3'	53.0	148	118°2'	89.1	208	166°1'	125.2	268	214°0'	161.3
29	23°2'	17.5	89	71°1'	53.6	149	119°0'	89.7	209	166°9'	125.8	269	214°8'	161.9
30	24°0'	18.1	90	71°9'	54.2	150	119°8'	90.3	210	167°7'	126.4	270	215°6'	162.5
31	24°8'	18.7	91	72°7'	54.8	151	120°6'	90.9	211	168°5'	127.0	271	216°4'	163.1
32	25°6'	19.3	92	73°5'	55.4	152	121°4'	91.5	212	169°3'	127.6	272	217°2'	163.7
33	26°4'	19.9	93	74°3'	56.0	153	122°2'	92.1	213	170°1'	128.2	273	218°0'	164.3
34	27°2'	20.5	94	75°1'	56.6	154	123°0'	92.7	214	170°9'	128.8	274	218°8'	164.9
35	28°0'	21.1	95	75°9'	57.2	155	123°8'	93.3	215	171°7'	129.4	275	219°6'	165.5
36	28°8'	21.7	96	76°7'	57.8	156	124°6'	93.9	216	172°5'	130.0	276	220°4'	166.1
37	29°6'	22.3	97	77°5'	58.4	157	125°4'	94.5	217	173°3'	130.6	277	221°2'	166.7
38	30°4'	22.9	98	78°3'	59.0	158	126°2'	95.1	218	174°1'	131.2	278	222°0'	167.3
39	31°2'	23.5	99	79°1'	59.6	159	127°0'	95.7	219	174°9'	131.8	279	222°8'	167.9
40	31°9'	24.1	100	79°9'	60.2	160	127°8'	96.3	220	175°7'	132.4	280	223°6'	168.5
41	32°7'	24.7	101	80°7'	60.8	161	128°6'	96.9	221	176°5'	133.0	281	224°4'	169.1
42	33°5'	25.3	102	81°5'	61.4	162	129°4'	97.5	222	177°3'	133.6	282	225°2'	169.7
43	34°3'	25.9	103	82°3'	62.0	163	130°2'	98.1	223	178°1'	134.2	283	226°0'	170.3
44	35°1'	26.5	104	83°1'	62.6	164	131°0'	98.7	224	178°9'	134.8	284	226°8'	170.9
45	35°9'	27.1	105	83°9'	63.2	165	131°8'	99.3	225	179°7'	135.4	285	227°6'	171.5
46	36°7'	27.7	106	84°7'	63.8	166	132°6'	99.9	226	180°5'	136.0	286	228°4'	172.1
47	37°5'	28.3	107	85°5'	64.4	167	133°4'	100.5	227	181°3'	136.6	287	229°2'	172.7
48	38°3'	28.9	108	86°3'	65.0	168	134°2'	101.1	228	182°1'	137.2	288	230°0'	173.3
49	39°1'	29.5	109	87°1'	65.6	169	135°0'	101.7	229	182°9'	137.8	289	230°8'	173.9
50	39°9'	30.1	110	87°9'	66.2	170	135°8'	102.3	230	183°7'	138.4	290	231°6'	174.5
51	40°7'	30.7	111	88°6'	66.8	171	136°6'	102.9	231	184°5'	139.0	291	232°4'	175.1
52	41°5'	31.3	112	89°4'	67.4	172	137°4'	103.5	232	185°3'	139.6	292	233°2'	175.7
53	42°3'	31.9	113	90°2'	68.0	173	138°2'	104.1	233	186°1'	140.2	293	234°0'	176.3
54	43°1'	32.5	114	91°0'	68.6	174	139°0'	104.7	234	186°9'	140.8	294	234°8'	176.9
55	43°9'	33.1	115	91°8'	69.2	175	139°8'	105.3	235	187°7'	141.4	295	235°6'	177.5
56	44°7'	33.7	116	92°6'	69.8	176	140°6'	105.9	236	188°5'	142.0	296	236°4'	178.1
57	45°5'	34.3	117	93°4'	70.4	177	141°4'	106.5	237	189°3'	142.6	297	237°2'	178.7
58	46°3'	34.9	118	94°2'	71.0	178	142°2'	107.1	238	190°1'	143.2	298	238°0'	179.3
59	47°1'	35.5	119	95°0'	71.6	179	143°0'	107.7	239	190°9'	143.8	299	238°8'	179.9
60	47°9'	36.1	120	95°8'	72.2	180	143°8'	108.3	240	191°7'	144.4	300	239°6'	180.5

FOR 53 DEGREES.

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00-8	00-6	61	48-1	37-6	121	95-3	74-5	181	142-6	111-4	241	189-9	169-4
2	01-6	01-2	62	48-9	38-2	122	96-1	75-1	182	143-4	112-1	242	190-7	170-0
3	02-4	01-8	63	49-6	38-8	123	96-9	75-7	183	144-2	112-7	243	191-5	170-6
4	03-2	02-5	64	50-4	39-4	124	97-7	76-3	184	145-0	113-3	244	192-3	171-2
5	03-9	03-1	65	51-2	40-0	125	98-5	77-0	185	145-8	113-9	245	193-1	171-8
6	04-7	03-7	66	52-0	40-6	126	99-3	77-6	186	146-6	114-5	246	193-9	172-4
7	05-5	04-3	67	52-8	41-2	127	100-1	78-2	187	147-4	115-1	247	194-6	173-0
8	06-3	04-9	68	53-6	41-9	128	100-9	78-8	188	148-1	115-7	248	195-4	173-6
9	07-1	05-5	69	54-4	42-5	129	101-7	79-4	189	148-9	116-4	249	196-2	174-2
10	07-9	06-2	70	55-2	43-1	130	102-4	80-0	190	149-7	117-0	250	197-0	174-8
11	08-7	06-8	71	55-9	43-7	131	103-2	80-7	191	150-5	117-6	251	197-8	175-4
12	09-5	07-4	72	56-7	44-3	132	104-0	81-3	192	151-3	118-2	252	198-6	176-0
13	10-2	08-0	73	57-5	44-9	133	104-8	81-9	193	152-1	118-8	253	199-4	176-6
14	11-0	08-6	74	58-3	45-6	134	105-6	82-5	194	152-9	119-4	254	200-2	177-2
15	11-8	09-2	75	59-1	46-2	135	106-4	83-1	195	153-7	120-1	255	200-9	177-8
16	12-6	09-9	76	59-9	46-8	136	107-2	83-7	196	154-5	120-7	256	201-7	178-4
17	13-4	10-5	77	60-7	47-4	137	108-0	84-3	197	155-2	121-3	257	202-5	179-0
18	14-2	11-1	78	61-5	48-0	138	108-7	85-0	198	156-0	121-9	258	203-3	179-6
19	15-0	11-7	79	62-3	48-6	139	109-5	85-6	199	156-8	122-5	259	204-1	180-2
20	15-8	12-3	80	63-0	49-3	140	110-3	86-2	200	157-6	123-1	260	204-9	180-8
21	16-5	12-9	81	63-8	49-9	141	111-1	86-8	201	158-4	123-7	261	205-7	181-4
22	17-3	13-5	82	64-6	50-5	142	111-9	87-4	202	159-2	124-4	262	206-5	182-0
23	18-1	14-2	83	65-4	51-1	143	112-7	88-0	203	160-0	125-0	263	207-3	182-6
24	18-9	14-8	84	66-2	51-7	144	113-5	88-7	204	160-8	125-6	264	208-1	183-2
25	19-7	15-4	85	67-0	52-3	145	114-3	89-3	205	161-5	126-2	265	208-9	183-8
26	20-5	16-0	86	67-8	52-9	146	115-0	89-9	206	162-3	126-8	266	209-6	184-4
27	21-3	16-6	87	68-6	53-6	147	115-8	90-5	207	163-1	127-4	267	210-4	185-0
28	22-1	17-2	88	69-3	54-2	148	116-6	91-1	208	163-9	128-1	268	211-2	185-6
29	22-9	17-9	89	70-1	54-8	149	117-4	91-7	209	164-7	128-7	269	212-0	186-2
30	23-6	18-5	90	70-9	55-4	150	118-2	92-3	210	165-5	129-3	270	212-8	186-8
31	24-4	19-1	91	71-7	56-0	151	119-0	93-0	211	166-3	129-9	271	213-6	187-4
32	25-2	19-7	92	72-5	56-6	152	119-8	93-6	212	167-1	130-5	272	214-4	188-0
33	26-0	20-3	93	73-3	57-3	153	120-6	94-2	213	167-8	131-1	273	215-2	188-6
34	26-8	20-9	94	74-1	57-9	154	121-4	94-8	214	168-6	131-8	274	216-0	189-2
35	27-6	21-5	95	74-9	58-5	155	122-1	95-4	215	169-4	132-4	275	216-8	189-8
36	28-4	22-2	96	75-6	59-1	156	122-9	96-0	216	170-2	133-0	276	217-6	190-4
37	29-2	22-8	97	76-4	59-7	157	123-7	96-7	217	171-0	133-6	277	218-4	191-0
38	29-9	23-4	98	77-2	60-3	158	124-5	97-3	218	171-8	134-2	278	219-2	191-6
39	30-7	24-0	99	78-0	61-0	159	125-3	97-9	219	172-6	134-8	279	220-0	192-2
40	31-5	24-6	100	78-8	61-6	160	126-1	98-5	220	173-4	135-4	280	220-8	192-8
41	32-3	25-2	101	79-6	62-2	161	126-9	99-1	221	174-2	136-1	281	221-6	193-4
42	33-1	25-9	102	80-4	62-8	162	127-7	99-7	222	174-9	136-7	282	222-4	194-0
43	33-9	26-5	103	81-2	63-4	163	128-4	100-4	223	175-7	137-3	283	223-2	194-6
44	34-7	27-1	104	82-0	64-0	164	129-2	101-0	224	176-5	137-9	284	224-0	195-2
45	35-5	27-7	105	82-7	64-6	165	130-0	101-6	225	177-3	138-5	285	224-8	195-8
46	36-2	28-3	106	83-5	65-3	166	130-8	102-2	226	178-1	139-1	286	225-6	196-4
47	37-0	28-9	107	84-3	65-9	167	131-6	102-8	227	178-9	139-8	287	226-4	197-0
48	37-8	29-6	108	85-1	66-5	168	132-4	103-4	228	179-7	140-4	288	227-2	197-6
49	38-6	30-2	109	85-9	67-1	169	133-2	104-0	229	180-5	141-0	289	228-0	198-2
50	39-4	30-8	110	86-7	67-7	170	134-0	104-7	230	181-2	141-6	290	228-8	198-8
51	40-2	31-4	111	87-5	68-3	171	134-7	105-3	231	182-0	142-2	291	229-6	199-4
52	41-0	32-0	112	88-3	68-9	172	135-5	105-9	232	182-8	142-8	292	230-4	200-0
53	41-8	32-6	113	89-0	69-6	173	136-3	106-5	233	183-6	143-4	293	231-2	200-6
54	42-6	33-2	114	89-8	70-2	174	137-1	107-1	234	184-4	144-1	294	232-0	201-2
55	43-3	33-9	115	90-6	70-8	175	137-9	107-7	235	185-2	144-7	295	232-8	201-8
56	44-1	34-5	116	91-4	71-4	176	138-7	108-4	236	186-0	145-3	296	233-6	202-4
57	44-9	35-1	117	92-2	72-0	177	139-5	109-0	237	186-8	145-9	297	234-4	203-0
58	45-7	35-7	118	93-0	72-6	178	140-3	109-6	238	187-5	146-5	298	235-2	203-6
59	46-5	36-3	119	93-8	73-3	179	141-1	110-3	239	188-3	147-1	299	236-0	204-2
60	47-3	36-9	120	94-6	73-9	180	141-8	110-9	240	189-1	147-8	300	236-8	204-8

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep.

FOR 52 DEGREES.

DIFFERENCE OF LATITUDE AND DEPARTURE FOR 39 DEGREES.

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p	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
6	61	47.4	38.4	121	94.0	76.1	181	140.7	113.9	241	187.3	151.7
3	62	48.2	39.0	122	94.6	76.8	182	141.4	114.5	242	188.1	152.3
9	63	49.0	39.6	123	95.6	77.4	183	142.2	115.2	243	188.8	152.9
5	64	49.7	40.3	124	96.4	78.0	184	143.0	115.8	244	189.6	153.6
1	65	50.5	40.9	125	97.1	78.7	185	143.8	116.4	245	190.4	154.2
8	66	51.3	41.5	126	97.9	79.3	186	144.5	117.1	246	191.2	154.8
4	67	52.1	42.2	127	98.7	79.9	187	145.3	117.7	247	192.0	155.4
0	68	52.8	42.8	128	99.5	80.6	188	146.1	118.3	248	192.7	156.1
7	69	53.6	43.4	129	100.3	81.2	189	146.9	118.9	249	193.5	156.7
3	70	54.4	44.1	130	101.0	81.8	190	147.7	119.6	250	194.3	157.3
9	71	55.2	44.7	131	101.8	82.4	191	148.4	120.2	251	195.1	158.0
6	72	56.0	45.3	132	102.6	83.1	192	149.2	120.8	252	195.8	158.6
2	73	56.7	45.9	133	103.4	83.7	193	150.0	121.5	253	196.6	159.2
8	74	57.5	46.6	134	104.1	84.3	194	150.8	122.1	254	197.4	159.8
4	75	58.3	47.2	135	104.9	85.0	195	151.5	122.7	255	198.2	160.5
1	76	59.1	47.8	136	105.7	85.6	196	152.3	123.3	256	198.9	161.1
7	77	59.8	48.5	137	106.5	86.2	197	153.1	124.0	257	199.7	161.7
3	78	60.6	49.1	138	107.2	86.8	198	153.9	124.6	258	200.5	162.4
0	79	61.4	49.7	139	108.0	87.5	199	154.7	125.2	259	201.3	163.0
6	80	62.2	50.3	140	108.8	88.1	200	155.4	125.9	260	202.1	163.6
2	81	62.9	51.0	141	109.6	88.7	201	156.2	126.5	261	202.8	164.3
8	82	63.7	51.6	142	110.4	89.4	202	157.0	127.1	262	203.6	164.9
5	83	64.5	52.2	143	111.1	90.0	203	157.8	127.8	263	204.4	165.5
1	84	65.3	52.9	144	111.9	90.6	204	158.5	128.4	264	205.2	166.1
7	85	66.1	53.5	145	112.7	91.3	205	159.3	129.0	265	205.9	166.8
4	86	66.8	54.1	146	113.5	91.9	206	160.1	129.6	266	206.7	167.4
0	87	67.6	54.8	147	114.2	92.5	207	160.9	130.3	267	207.5	168.0
6	88	68.4	55.4	148	115.0	93.1	208	161.6	130.9	268	208.3	168.7
3	89	69.2	56.0	149	115.8	93.8	209	162.4	131.5	269	209.1	169.3
9	90	69.9	56.6	150	116.6	94.4	210	163.2	132.2	270	209.8	169.9
5	91	70.7	57.3	151	117.3	95.0	211	164.0	132.8	271	210.6	170.5
1	92	71.5	57.9	152	118.1	95.7	212	164.8	133.4	272	211.4	171.2
8	93	72.3	58.5	153	118.9	96.3	213	165.5	134.0	273	212.2	171.8
4	94	73.1	59.2	154	119.7	96.9	214	166.3	134.7	274	212.9	172.4
0	95	73.8	59.8	155	120.5	97.5	215	167.1	135.3	275	213.7	173.1
7	96	74.6	60.4	156	121.2	98.2	216	167.9	135.9	276	214.5	173.7
3	97	75.4	61.0	157	122.0	98.8	217	168.6	136.6	277	215.3	174.3
9	98	76.2	61.7	158	122.8	99.4	218	169.4	137.2	278	216.0	175.0
6	99	76.9	62.3	159	123.6	100.1	219	170.2	137.8	279	216.8	175.6
2	100	77.7	62.9	160	124.3	100.7	220	171.0	138.5	280	217.6	176.2
8	101	78.5	63.6	161	125.1	101.3	221	171.7	139.1	281	218.4	176.8
4	102	79.3	64.2	162	125.9	101.9	222	172.5	139.7	282	219.2	177.5
1	103	80.0	64.8	163	126.7	102.6	223	173.3	140.3	283	219.9	178.1
7	104	80.8	65.4	164	127.5	103.2	224	174.1	141.0	284	220.7	178.7
3	105	81.6	66.1	165	128.2	103.8	225	174.9	141.6	285	221.5	179.4
9	106	82.4	66.7	166	129.0	104.5	226	175.6	142.2	286	222.3	180.0
6	107	83.2	67.3	167	129.8	105.1	227	176.4	142.9	287	223.0	180.6
2	108	83.9	68.0	168	130.6	105.7	228	177.2	143.5	288	223.8	181.2
8	109	84.7	68.6	169	131.3	106.4	229	178.0	144.1	289	224.6	181.9
5	110	85.5	69.2	170	132.1	107.0	230	178.7	144.7	290	225.4	182.5
1	111	86.3	69.9	171	132.9	107.6	231	179.5	145.4	291	226.1	183.1
7	112	87.0	70.5	172	133.7	108.2	232	180.3	146.0	292	226.9	183.8
4	113	87.8	71.1	173	134.4	108.9	233	181.1	146.6	293	227.7	184.4
0	114	88.6	71.7	174	135.2	109.5	234	181.9	147.3	294	228.5	185.0
6	115	89.4	72.4	175	136.0	110.1	235	182.6	147.9	295	229.3	185.6
3	116	90.1	73.0	176	136.8	110.8	236	183.4	148.5	296	230.0	186.3
9	117	90.9	73.6	177	137.6	111.4	237	184.2	149.1	297	230.8	186.9
5	118	91.7	74.3	178	138.3	112.0	238	185.0	149.8	298	231.6	187.5
1	119	92.5	74.9	179	139.1	112.6	239	185.7	150.4	299	232.4	188.2
8	120	93.3	75.6	180	139.9	113.3	240	186.5	151.0	300	233.1	188.8

Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat. Dist. Dep. Lat.

FOR 51 DEGREES.

12	092	077	72	552	463	132	1011	848	192	147-1	122
13	100	084	73	559	469	133	1019	855	193	147-8	124
14	107	090	74	567	476	134	1026	861	194	148-6	124
15	115	096	75	575	482	135	1034	868	195	149-4	125
16	123	103	76	582	489	136	1042	874	196	150-1	126
17	130	109	77	590	495	137	1049	881	197	150-9	126
18	138	116	78	598	501	138	1057	887	198	151-7	127
19	146	122	79	605	508	139	1065	893	199	152-4	127
20	153	129	80	613	514	140	1072	900	200	153-2	128
21	161	135	81	620	521	141	1080	906	201	154-0	129
22	169	141	82	628	527	142	1088	913	202	154-7	129
23	176	148	83	636	534	143	1095	919	203	155-5	130
24	184	154	84	643	540	144	1103	926	204	156-3	131
25	192	161	85	651	546	145	1111	932	205	157-0	131
26	199	167	86	659	553	146	1118	938	206	157-8	132
27	207	174	87	666	559	147	1126	945	207	158-6	133
28	214	180	88	674	566	148	1134	951	208	159-3	133
29	222	186	89	682	572	149	1141	958	209	160-1	134
30	230	193	90	689	579	150	1149	964	210	160-9	135
31	237	199	91	697	585	151	1157	971	211	161-6	135
32	245	206	92	705	591	152	1164	977	212	162-4	136
33	253	212	93	712	598	153	1172	983	213	163-2	136
34	260	219	94	720	604	154	1180	990	214	163-9	137
35	268	225	95	728	611	155	1187	996	215	164-7	138
36	276	231	96	735	617	156	1195	1003	216	165-5	138
37	283	238	97	743	624	157	1203	1009	217	166-2	139
38	291	244	98	751	630	158	1210	1016	218	167-0	140
39	299	251	99	758	636	159	1218	1022	219	167-8	140
40	306	257	100	766	643	160	1226	1028	220	168-5	141
41	314	264	101	774	649	161	1233	1035	221	169-3	142
42	322	270	102	781	656	162	1241	1041	222	170-1	142
43	329	276	103	789	662	163	1249	1048	223	170-8	143
44	337	283	104	797	668	164	1256	1054	224	171-6	144
45	345	289	105	804	675	165	1264	1061	225	172-4	144
46	352	296	106	812	681	166	1272	1067	226	173-1	145

TABLE 5. DIFFERENCE OF LATITUDE AND DEPARTURE FOR 41 DEGREES.

81

D.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00 8	00 7	61	48 0	40 0	121	91 3	79 4	181	138 6	118 7	241	181 9	158 1
2	01 5	01 3	62	48 8	40 7	122	92 1	80 0	182	137 4	119 4	242	182 6	158 8
3	02 3	02 0	63	47 5	41 3	123	92 8	80 7	183	138 1	120 1	243	183 4	159 4
4	03 0	02 6	64	48 3	42 0	124	93 6	81 4	184	138 9	120 7	244	184 1	160 1
5	03 8	03 3	65	49 1	42 6	125	94 3	82 0	185	139 6	121 4	245	184 9	160 7
6	04 5	03 9	66	49 8	43 3	126	95 1	82 7	186	140 4	122 0	246	185 7	161 4
7	05 3	04 6	67	50 6	44 0	127	95 8	83 3	187	141 1	122 7	247	186 4	162 0
8	06 0	05 2	68	51 3	44 6	128	96 6	84 0	188	141 9	123 3	248	187 2	162 7
9	06 8	05 9	69	52 1	45 3	129	97 4	84 6	189	142 6	124 0	249	187 9	163 4
10	07 5	06 6	70	52 8	45 9	130	98 1	85 3	190	143 4	124 7	250	188 7	164 0
11	08 3	07 2	71	53 6	46 6	131	98 9	85 9	191	144 1	125 3	251	189 4	164 7
12	09 1	07 9	72	54 3	47 2	132	99 6	86 6	192	144 9	126 0	252	190 2	165 3
13	09 8	08 5	73	55 1	47 9	133	100 4	87 3	193	145 7	126 6	253	190 9	166 0
14	10 6	09 2	74	55 8	48 5	134	101 1	87 9	194	146 4	127 3	254	191 7	166 6
15	11 3	09 8	75	56 6	49 2	135	101 9	88 6	195	147 2	127 9	255	192 5	167 3
16	12 1	10 5	76	57 4	49 9	136	102 6	89 2	196	147 9	128 6	256	193 2	168 0
17	12 8	11 2	77	58 1	50 5	137	103 4	89 9	197	148 7	129 2	257	194 0	168 6
18	13 6	11 8	78	58 9	51 2	138	104 1	90 5	198	149 4	129 9	258	194 7	169 3
19	14 3	12 5	79	59 6	51 8	139	104 9	91 2	199	150 2	130 6	259	195 5	169 9
20	15 1	13 1	80	60 4	52 5	140	105 7	91 8	200	150 9	131 2	260	196 2	170 6
21	15 8	13 8	81	61 1	53 1	141	106 4	92 5	201	151 7	131 9	261	197 0	171 2
22	16 6	14 4	82	61 9	53 8	142	107 2	93 2	202	152 5	132 5	262	197 7	171 9
23	17 4	15 1	83	62 6	54 5	143	107 9	93 8	203	153 2	133 2	263	198 5	172 5
24	18 1	15 7	84	63 4	55 1	144	108 7	94 5	204	154 0	133 8	264	199 2	173 2
25	18 9	16 4	85	64 2	55 8	145	109 4	95 1	205	154 7	134 5	265	200 0	173 9
26	19 6	17 1	86	64 9	56 4	146	110 2	95 8	206	155 5	135 1	266	200 8	174 5
27	20 4	17 7	87	65 7	57 1	147	110 9	96 4	207	156 2	135 8	267	201 5	175 2
28	21 1	18 4	88	66 4	57 7	148	111 7	97 1	208	157 0	136 5	268	202 3	175 8
29	21 9	19 0	89	67 2	58 4	149	112 5	97 8	209	157 7	137 1	269	203 0	176 5
30	22 6	19 7	90	67 9	59 0	150	113 2	98 4	210	158 5	137 8	270	203 8	177 1
31	23 4	20 3	91	68 7	59 7	151	114 0	99 1	211	159 2	138 4	271	204 5	177 8
32	24 2	21 0	92	69 4	60 4	152	114 7	99 7	212	160 0	139 1	272	205 3	178 4
33	24 9	21 6	93	70 2	61 0	153	115 5	100 4	213	160 8	139 7	273	206 0	179 1
34	25 7	22 3	94	70 9	61 7	154	116 2	101 0	214	161 5	140 4	274	206 8	179 8
35	26 4	23 0	95	71 7	62 3	155	117 0	101 7	215	162 3	141 1	275	207 5	180 4
36	27 2	23 6	96	72 5	63 0	156	117 7	102 3	216	163 0	141 7	276	208 3	181 1
37	27 9	24 3	97	73 2	63 6	157	118 5	103 0	217	163 8	142 4	277	209 1	181 7
38	28 7	24 9	98	74 0	64 3	158	119 2	103 7	218	164 5	143 0	278	209 8	182 4
39	29 4	25 6	99	74 7	64 9	159	120 0	104 3	219	165 3	143 7	279	210 6	183 0
40	30 2	26 2	100	75 5	65 6	160	120 8	105 0	220	166 0	144 3	280	211 3	183 7
41	30 9	26 9	101	76 2	66 3	161	121 5	105 6	221	166 8	145 0	281	212 1	184 4
42	31 7	27 6	102	77 0	66 9	162	122 3	106 3	222	167 5	145 6	282	212 8	185 0
43	32 5	28 2	103	77 7	67 6	163	123 0	106 9	223	168 3	146 3	283	213 6	185 7
44	33 2	28 9	104	78 5	68 2	164	123 8	107 6	224	169 1	147 0	284	214 3	186 3
45	34 0	29 5	105	79 2	68 9	165	124 5	108 2	225	169 8	147 6	285	215 1	187 0
46	34 7	30 2	106	80 0	69 5	166	125 3	108 9	226	170 6	148 3	286	215 8	187 6
47	35 5	30 8	107	80 8	70 2	167	126 0	109 6	227	171 3	148 9	287	216 6	188 3
48	36 2	31 5	108	81 5	70 9	168	126 8	110 2	228	172 1	149 6	288	217 4	188 9
49	37 0	32 1	109	82 3	71 5	169	127 5	110 9	229	172 8	150 2	289	218 1	189 6
50	37 7	32 8	110	83 0	72 2	170	128 3	111 5	230	173 6	150 9	290	218 9	190 3
51	38 5	33 5	111	83 8	72 8	171	129 1	112 2	231	174 3	151 5	291	219 6	190 9
52	39 3	34 1	112	84 5	73 5	172	129 8	112 8	232	175 1	152 2	292	220 4	191 6
53	40 0	34 8	113	85 3	74 1	173	130 6	113 5	233	175 8	152 9	293	221 1	192 2
54	40 8	35 4	114	86 0	74 8	174	131 3	114 2	234	176 6	153 5	294	221 9	192 9
55	41 5	36 1	115	86 8	75 4	175	132 1	114 8	235	177 4	154 2	295	222 6	193 5
56	42 3	36 7	116	87 5	76 1	176	132 8	115 5	236	178 1	154 8	296	223 4	194 2
57	43 0	37 4	117	88 3	76 8	177	133 6	116 1	237	178 9	155 5	297	224 1	194 8
58	43 8	38 1	118	89 1	77 4	178	134 3	116 8	238	179 6	156 1	298	224 9	195 5
59	44 5	38 7	119	89 8	78 1	179	135 1	117 4	239	180 4	156 8	299	225 7	196 2
60	45 3	39 4	120	90 6	78 7	180	135 8	118 1	240	181 1	157 5	300	226 4	196 8
See.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 49 DEGREES.

E 3

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	007	007	81	45:5	40:5	121	89:9	81:0	181	134:5	121:1	241	179:1	181:9
2	015	013	82	46:1	41:8	122	90:7	81:6	182	135:3	121:8	242	179:6	181:9
3	022	020	83	46:2	42:2	123	91:4	82:3	183	136:0	122:5	243	180:6	182:9
4	030	027	84	47:6	42:8	124	92:1	83:0	184	136:7	123:1	244	181:3	183:9
5	037	033	85	48:3	43:5	125	92:9	83:6	185	137:5	123:8	245	182:1	184:9
6	045	040	86	49:0	44:2	126	93:6	84:3	186	138:2	124:5	246	182:8	184:9
7	052	047	87	49:8	44:8	127	94:4	85:0	187	139:0	125:1	247	183:6	185:9
8	059	054	88	50:5	45:6	128	95:1	85:6	188	139:7	125:8	248	184:3	185:9
9	067	060	89	51:3	46:2	129	95:9	86:3	189	140:5	126:5	249	185:0	185:9
10	074	067	70	52:0	46:8	130	96:6	87:0	190	141:2	127:1	250	185:8	185:9
11	082	074	71	52:8	47:5	131	97:4	87:7	191	141:9	127:8	251	186:5	186:9
12	089	080	72	53:5	48:2	132	98:1	88:3	192	142:7	128:5	252	187:3	187:9
13	097	087	73	54:2	48:9	133	98:8	88:9	193	143:4	129:1	253	188:0	187:9
14	104	094	74	55:0	49:5	134	99:6	89:6	194	144:2	129:8	254	188:8	188:9
15	111	100	75	55:7	50:2	135	100:3	90:3	195	144:9	130:5	255	189:5	189:9
16	119	107	76	56:5	50:9	136	101:1	91:0	196	145:7	131:1	256	190:2	189:9
17	126	114	77	57:2	51:5	137	101:8	91:7	197	146:4	131:8	257	191:0	190:9
18	134	120	78	58:0	52:2	138	102:6	92:3	198	147:1	132:5	258	191:7	191:9
19	141	127	79	58:7	52:9	139	103:3	93:0	199	147:9	133:2	259	192:5	192:9
20	149	134	80	59:5	53:5	140	104:0	93:7	200	148:6	133:8	260	193:2	193:9
21	156	141	81	60:2	54:2	141	104:8	94:3	201	149:4	134:5	261	194:0	193:9
22	163	147	82	60:9	54:9	142	105:5	95:0	202	150:1	135:2	262	194:7	193:9
23	171	154	83	61:7	55:5	143	106:3	95:7	203	150:9	135:8	263	195:4	194:9
24	178	161	84	62:4	56:2	144	107:0	96:4	204	151:6	136:5	264	196:2	195:9
25	186	167	85	63:2	56:9	145	107:8	97:0	205	152:3	137:2	265	196:9	196:9
26	193	174	86	63:9	57:5	146	108:5	97:7	206	153:1	137:8	266	197:7	196:9
27	201	181	87	64:7	58:2	147	109:2	98:4	207	153:8	138:5	267	198:4	197:9
28	208	187	88	65:5	58:9	148	110:0	99:0	208	154:6	139:2	268	199:2	199:9
29	216	194	89	66:1	59:6	149	110:7	99:7	209	155:3	139:8	269	199:9	199:9
30	223	201	90	66:9	60:2	150	111:5	100:4	210	156:1	140:5	270	200:6	199:9
31	230	207	91	67:6	60:9	151	112:2	101:0	211	156:8	141:2	271	201:4	199:9
32	238	214	92	68:4	61:6	152	113:0	101:7	212	157:5	141:9	272	202:1	200:9
33	245	221	93	69:1	62:2	153	113:7	102:4	213	158:3	142:5	273	202:9	200:9
34	253	228	94	69:9	62:9	154	114:4	103:2	214	159:0	143:2	274	203:6	201:9
35	260	234	95	70:6	63:6	155	115:2	103:7	215	159:8	143:9	275	204:4	201:9
36	268	241	96	71:3	64:3	156	115:9	104:4	216	160:5	144:5	276	205:1	202:9
37	275	248	97	72:1	64:9	157	116:7	105:1	217	161:3	145:2	277	205:9	203:9
38	282	254	98	72:8	65:6	158	117:4	105:7	218	162:0	145:9	278	206:6	204:9
39	290	261	99	73:6	66:2	159	118:2	106:4	219	162:7	146:5	279	207:3	205:9
40	297	268	100	74:3	66:9	160	118:9	107:1	220	163:5	147:2	280	208:1	206:9
41	305	274	101	75:1	67:6	161	119:6	107:7	221	164:2	147:9	281	208:8	206:9
42	312	281	102	75:8	68:3	162	120:4	108:4	222	165:0	148:5	282	209:6	207:9
43	320	288	103	76:6	68:9	163	121:1	109:1	223	165:7	149:2	283	210:3	207:9
44	327	294	104	77:3	69:6	164	121:9	109:7	224	166:5	149:9	284	211:1	208:9
45	334	301	105	78:0	70:3	165	122:6	110:4	225	167:2	150:6	285	211:8	208:9
46	342	308	106	78:8	70:9	166	123:4	111:1	226	168:0	151:2	286	212:5	209:9
47	349	314	107	79:5	71:6	167	124:1	111:7	227	168:7	151:9	287	213:3	209:9
48	357	321	108	80:3	72:3	168	124:8	112:4	228	169:4	152:6	288	214:0	210:9
49	364	328	109	81:0	72:9	169	125:6	113:1	229	170:2	153:2	289	214:8	210:9
50	372	335	110	81:7	73:6	170	126:3	113:8	230	170:9	153:9	290	215:5	211:9
51	379	341	111	82:5	74:3	171	127:1	114:4	231	171:7	154:6	291	216:3	211:9
52	386	348	112	83:2	74:9	172	127:8	115:1	232	172:4	155:2	292	217:0	212:9
53	394	355	113	84:0	75:6	173	128:6	115:8	233	173:2	155:9	293	217:7	212:9
54	401	361	114	84:7	76:3	174	129:3	116:4	234	173:9	156:6	294	218:5	213:9
55	409	368	115	85:5	77:0	175	130:1	117:1	235	174:6	157:2	295	219:2	213:9
56	416	375	116	86:2	77:6	176	130:8	117:8	236	175:4	157:9	296	220:0	214:9
57	424	381	117	86:9	78:3	177	131:5	118:4	237	176:1	158:6	297	220:7	214:9
58	431	388	118	87:7	79:0	178	132:3	119:1	238	176:9	159:3	298	221:5	215:9
59	438	395	119	88:4	79:6	179	133:0	119:8	239	177:6	159:9	299	222:2	215:9
60	446	401	120	89:2	80:3	180	133:8	120:4	240	178:4	160:6	300	222:9	216:9

FOR 48 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 43 DEGREES. 83

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	007	007	61	44.6	41.6	121	89.5	82.5	181	132.4	123.4	241	176.3	164.4
2	015	014	62	45.3	42.3	122	89.2	83.2	182	133.1	124.1	242	177.0	165.0
3	022	020	63	46.1	43.0	123	90.0	83.9	183	133.8	124.8	243	177.7	165.7
4	029	027	64	46.8	43.6	124	90.7	84.6	184	134.6	125.5	244	178.5	166.4
5	037	034	65	47.5	44.3	125	91.4	85.2	185	135.3	126.2	245	179.2	167.1
6	044	041	66	48.3	45.0	126	92.2	85.9	186	136.0	126.9	246	179.9	167.8
7	051	048	67	49.0	45.7	127	92.9	86.6	187	136.8	127.5	247	180.6	168.5
8	059	055	68	49.7	46.4	128	93.6	87.3	188	137.5	128.2	248	181.4	169.1
9	066	061	69	50.5	47.1	129	94.3	88.0	189	138.2	128.9	249	182.1	169.8
10	073	068	70	51.2	47.7	130	95.1	88.7	190	139.0	129.6	250	182.8	170.5
11	080	075	71	51.9	48.4	131	95.8	89.3	191	139.7	130.3	251	183.6	171.2
12	088	082	72	52.7	49.1	132	96.5	90.0	192	140.4	130.9	252	184.3	171.9
13	095	089	73	53.4	49.8	133	97.3	90.7	193	141.2	131.6	253	185.0	172.5
14	102	095	74	54.1	50.5	134	98.0	91.4	194	141.9	132.3	254	185.8	173.2
15	110	102	75	54.9	51.1	135	98.7	92.1	195	142.6	133.0	255	186.5	173.9
16	117	109	76	55.6	51.8	136	99.5	92.8	196	143.3	133.7	256	187.2	174.6
17	124	116	77	56.3	52.5	137	100.2	93.4	197	144.1	134.4	257	188.0	175.3
18	132	123	78	57.0	53.2	138	100.9	94.1	198	144.8	135.0	258	188.7	176.0
19	139	130	79	57.8	53.9	139	101.7	94.8	199	145.5	135.7	259	189.4	176.6
20	146	136	80	58.5	54.6	140	102.4	95.5	200	146.3	136.4	260	190.2	177.3
21	154	143	81	59.2	55.2	141	103.1	96.2	201	147.0	137.1	261	190.9	178.0
22	161	150	82	60.0	55.9	142	103.9	96.8	202	147.7	137.8	262	191.6	178.7
23	168	157	83	60.7	56.6	143	104.6	97.5	203	148.5	138.4	263	192.3	179.4
24	176	164	84	61.4	57.3	144	105.3	98.2	204	149.2	139.1	264	193.1	180.0
25	183	170	85	62.2	58.0	145	106.0	98.9	205	149.9	139.8	265	193.8	180.7
26	190	177	86	62.9	58.7	146	106.8	99.6	206	150.7	140.5	266	194.5	181.4
27	197	184	87	63.6	59.3	147	107.5	100.3	207	151.4	141.2	267	195.3	182.1
28	205	191	88	64.4	60.0	148	108.2	100.9	208	152.1	141.9	268	196.0	182.8
29	212	198	89	65.1	60.7	149	109.0	101.6	209	152.9	142.5	269	196.7	183.5
30	219	205	90	65.8	61.4	150	109.7	102.3	210	153.6	143.2	270	197.5	184.1
31	227	211	91	66.6	62.1	151	110.4	103.0	211	154.3	143.9	271	198.2	184.8
32	234	218	92	67.3	62.7	152	111.2	103.7	212	155.0	144.6	272	198.9	185.5
33	241	225	93	68.0	63.4	153	111.9	104.3	213	155.8	145.3	273	199.7	186.2
34	249	232	94	68.7	64.1	154	112.6	105.0	214	156.5	145.9	274	200.4	186.9
35	256	239	95	69.5	64.8	155	113.4	105.7	215	157.2	146.6	275	201.1	187.5
36	263	246	96	70.2	65.5	156	114.1	106.4	216	158.0	147.3	276	201.9	188.2
37	271	252	97	70.9	66.2	157	114.8	107.1	217	158.7	148.0	277	202.6	188.9
38	278	259	98	71.7	66.8	158	115.6	107.8	218	159.4	148.7	278	203.3	189.6
39	285	266	99	72.4	67.5	159	116.3	108.4	219	160.2	149.4	279	204.0	190.3
40	293	273	100	73.1	68.2	160	117.0	109.1	220	160.9	150.0	280	204.8	191.0
41	300	280	101	73.9	68.9	161	117.7	109.8	221	161.6	150.7	281	205.5	191.6
42	307	286	102	74.6	69.6	162	118.5	110.5	222	162.4	151.4	282	206.2	192.3
43	314	293	103	75.3	70.2	163	119.2	111.2	223	163.1	152.1	283	207.0	193.0
44	322	300	104	76.1	70.9	164	119.9	111.8	224	163.8	152.8	284	207.7	193.7
45	329	307	105	76.8	71.6	165	120.7	112.5	225	164.6	153.4	285	208.4	194.4
46	336	314	106	77.6	72.3	166	121.4	113.2	226	165.3	154.1	286	209.2	195.1
47	344	321	107	78.3	73.0	167	122.1	113.9	227	166.0	154.8	287	209.9	195.7
48	351	327	108	79.0	73.7	168	122.9	114.6	228	166.7	155.5	288	210.6	196.4
49	358	334	109	79.7	74.3	169	123.6	115.3	229	167.5	156.2	289	211.4	197.1
50	366	341	110	80.4	75.0	170	124.3	115.9	230	168.2	156.9	290	212.1	197.8
51	373	348	111	81.2	75.7	171	125.1	116.6	231	168.9	157.5	291	212.8	198.5
52	380	355	112	81.9	76.4	172	125.8	117.3	232	169.7	158.2	292	213.6	199.1
53	388	361	113	82.6	77.1	173	126.5	118.0	233	170.4	158.9	293	214.3	199.8
54	395	368	114	83.4	77.7	174	127.3	118.7	234	171.1	159.6	294	215.0	200.5
55	402	375	115	84.1	78.4	175	128.0	119.3	235	171.9	160.3	295	215.7	201.2
56	410	382	116	84.8	79.1	176	128.7	120.0	236	172.6	161.0	296	216.5	201.9
57	417	389	117	85.6	79.8	177	129.4	120.7	237	173.3	161.6	297	217.2	202.6
58	424	396	118	86.3	80.5	178	130.2	121.4	238	174.1	162.3	298	217.9	203.2
59	431	402	119	87.0	81.2	179	130.9	122.1	239	174.8	163.0	299	218.7	203.9
60	439	409	120	87.8	81.8	180	131.6	122.8	240	175.5	163.7	300	219.4	204.6
E.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 47 DEGREES.

84 DIFFERENCE OF LATITUDE AND DEPARTURE FOR 44 DEGREES. [TABLE 5.]

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	007	007	61	43.9	42.4	121	87.0	84.1	181	130.2	125.7	241	173.4	167.4
2	014	014	62	44.6	43.1	122	87.8	84.7	182	130.9	126.4	242	174.1	168.1
3	022	021	63	45.3	43.8	123	88.5	85.4	183	131.6	127.1	243	174.8	168.8
4	029	028	64	46.0	44.5	124	89.2	86.1	184	132.4	127.8	244	175.5	169.5
5	036	035	65	46.8	45.2	125	89.9	86.8	185	133.1	128.5	245	176.2	170.2
6	043	042	66	47.5	45.8	126	90.6	87.5	186	133.8	129.2	246	177.0	170.9
7	050	049	67	48.2	46.5	127	91.4	88.2	187	134.5	129.9	247	177.7	171.6
8	056	056	68	48.9	47.2	128	92.1	88.9	188	135.2	130.6	248	178.4	172.3
9	063	063	69	49.6	47.9	129	92.8	89.6	189	136.0	131.3	249	179.1	173.0
10	072	069	70	50.4	48.6	130	93.6	90.3	190	136.7	132.0	250	179.8	173.7
11	079	076	71	51.1	49.3	131	94.2	91.0	191	137.4	132.7	251	180.6	174.4
12	086	083	72	51.8	50.0	132	95.0	91.7	192	138.1	133.4	252	181.3	175.1
13	094	090	73	52.5	50.7	133	95.7	92.4	193	138.8	134.1	253	182.0	175.8
14	101	097	74	53.2	51.4	134	96.4	93.1	194	139.6	134.8	254	182.7	176.5
15	108	104	75	54.0	52.1	135	97.1	93.8	195	140.3	135.5	255	183.4	177.1
16	115	111	76	54.7	52.8	136	97.8	94.5	196	141.0	136.2	256	184.2	177.8
17	122	118	77	55.4	53.5	137	98.5	95.2	197	141.7	136.8	257	184.9	178.5
18	129	125	78	56.1	54.2	138	99.3	95.9	198	142.4	137.5	258	185.6	179.2
19	137	132	79	56.8	54.9	139	100.0	96.6	199	143.1	138.2	259	186.3	179.9
20	144	139	80	57.5	55.6	140	100.7	97.3	200	143.9	138.9	260	187.0	180.6
21	151	146	81	58.3	56.3	141	101.4	97.9	201	144.6	139.6	261	187.7	181.3
22	158	153	82	59.0	57.0	142	102.1	98.6	202	145.3	140.3	262	188.5	182.0
23	165	160	83	59.7	57.7	143	102.9	99.3	203	146.0	141.0	263	189.2	182.7
24	173	167	84	60.4	58.4	144	103.6	100.0	204	146.7	141.7	264	189.9	183.4
25	180	174	85	61.1	59.0	145	104.3	100.7	205	147.5	142.4	265	190.6	184.1
26	187	181	86	61.9	59.7	146	105.0	101.4	206	148.2	143.1	266	191.3	184.8
27	194	188	87	62.6	60.4	147	105.7	102.1	207	148.9	143.8	267	192.1	185.5
28	201	195	88	63.3	61.1	148	106.5	102.8	208	149.6	144.5	268	192.8	186.2
29	209	201	89	64.0	61.8	149	107.2	103.5	209	150.3	145.2	269	193.5	186.9
30	216	208	90	64.7	62.5	150	107.9	104.2	210	151.1	145.9	270	194.2	187.6
31	223	215	91	65.5	63.2	151	108.6	104.9	211	151.8	146.6	271	194.9	188.3
32	230	222	92	66.2	63.9	152	109.3	105.6	212	152.5	147.3	272	195.7	189.0
33	237	229	93	66.9	64.6	153	110.1	106.3	213	153.2	148.0	273	196.4	189.7
34	245	236	94	67.6	65.3	154	110.8	107.0	214	153.9	148.7	274	197.1	190.4
35	252	243	95	68.3	66.0	155	111.5	107.7	215	154.7	149.4	275	197.8	191.1
36	259	250	96	69.1	66.7	156	112.2	108.4	216	155.4	150.0	276	198.5	191.8
37	266	257	97	69.8	67.4	157	112.9	109.1	217	156.1	150.7	277	199.3	192.5
38	273	264	98	70.5	68.1	158	113.7	109.8	218	156.8	151.4	278	200.0	193.2
39	281	271	99	71.2	68.8	159	114.4	110.5	219	157.5	152.1	279	200.7	193.9
40	288	278	100	71.9	69.5	160	115.1	111.1	220	158.3	152.8	280	201.4	194.6
41	295	285	101	72.7	70.2	161	115.8	111.8	221	159.0	153.5	281	202.1	195.3
42	302	292	102	73.4	70.9	162	116.5	112.5	222	159.7	154.2	282	202.8	196.0
43	309	299	103	74.1	71.5	163	117.3	113.2	223	160.4	154.9	283	203.6	196.7
44	317	306	104	74.8	72.2	164	118.0	113.9	224	161.1	155.6	284	204.3	197.4
45	324	313	105	75.5	72.9	165	118.7	114.6	225	161.9	156.3	285	205.0	198.1
46	331	320	106	76.3	73.6	166	119.4	115.3	226	162.6	157.0	286	205.7	198.8
47	338	326	107	77.0	74.3	167	120.1	116.0	227	163.3	157.7	287	206.4	199.5
48	345	333	108	77.7	75.0	168	120.8	116.7	228	164.0	158.4	288	207.2	200.2
49	352	340	109	78.4	75.7	169	121.6	117.4	229	164.7	159.1	289	207.9	200.9
50	360	347	110	79.1	76.4	170	122.3	118.1	230	165.4	159.8	290	208.6	201.6
51	367	354	111	79.8	77.1	171	123.0	118.8	231	166.2	160.5	291	209.3	202.3
52	374	361	112	80.6	77.8	172	123.7	119.5	232	166.9	161.2	292	210.0	203.0
53	381	368	113	81.3	78.5	173	124.4	120.2	233	167.6	161.9	293	210.8	203.7
54	388	375	114	82.0	79.2	174	125.2	120.9	234	168.3	162.6	294	211.5	204.4
55	396	382	115	82.7	79.9	175	125.9	121.6	235	169.0	163.3	295	212.2	205.1
56	403	389	116	83.4	80.6	176	126.6	122.3	236	169.8	163.9	296	212.9	205.8
57	410	396	117	84.2	81.3	177	127.3	123.0	237	170.5	164.6	297	213.6	206.5
58	417	403	118	84.9	82.0	178	128.0	123.6	238	171.2	165.3	298	214.4	207.2
59	424	410	119	85.6	82.7	179	128.8	124.3	239	171.9	166.0	299	215.1	207.9
60	432	417	120	86.3	83.4	180	129.5	125.0	240	172.6	166.7	300	215.8	208.6
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 46 DEGREES.

TABLE 5.] DIFFERENCE OF LATITUDE AND DEPARTURE FOR 45 DEGREES.

85

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.7	00.7	61	43.1	43.1	121	85.6	85.6	181	128.0	128.0	241	170.4	170.4
2	01.4	01.4	62	43.8	43.8	122	86.3	86.3	182	128.7	128.7	242	171.1	171.1
3	02.1	02.1	63	44.5	44.5	123	87.0	87.0	183	129.4	129.4	243	171.8	171.8
4	02.8	02.8	64	45.2	45.3	124	87.7	87.7	184	130.1	130.1	244	172.5	172.5
5	03.5	03.5	65	46.0	46.0	125	88.4	88.4	185	130.8	130.8	245	173.2	173.2
6	04.2	04.2	66	46.7	46.7	126	89.1	89.1	186	131.5	131.5	246	173.9	173.9
7	04.9	04.9	67	47.4	47.4	127	89.8	89.8	187	132.2	132.2	247	174.7	174.7
8	05.7	05.7	68	48.1	48.1	128	90.5	90.5	188	132.9	132.9	248	175.4	175.4
9	06.4	06.4	69	48.8	48.8	129	91.2	91.2	189	133.6	133.6	249	176.1	176.1
10	07.1	07.1	70	49.5	49.5	130	91.9	91.9	190	134.3	134.3	250	176.8	176.8
11	07.8	07.8	71	50.2	50.2	131	92.6	92.6	191	135.1	135.1	251	177.5	177.5
12	08.5	08.5	72	50.9	50.9	132	93.3	93.3	192	135.8	135.8	252	178.2	178.2
13	09.2	09.2	73	51.6	51.6	133	94.0	94.0	193	136.5	136.5	253	178.9	178.9
14	09.9	09.9	74	52.3	52.3	134	94.8	94.8	194	137.2	137.2	254	179.6	179.6
15	10.6	10.6	75	53.0	53.0	135	95.5	95.5	195	137.9	137.9	255	180.3	180.3
16	11.3	11.3	76	53.7	53.7	136	96.2	96.2	196	138.6	138.6	256	181.0	181.0
17	12.0	12.0	77	54.4	54.4	137	96.9	96.9	197	139.3	139.3	257	181.7	181.7
18	12.7	12.7	78	55.2	55.2	138	97.6	97.6	198	140.0	140.0	258	182.4	182.4
19	13.4	13.4	79	55.9	55.9	139	98.3	98.3	199	140.7	140.7	259	183.1	183.1
20	14.1	14.1	80	56.6	56.6	140	99.0	99.0	200	141.4	141.4	260	183.8	183.8
21	14.8	14.8	81	57.3	57.3	141	99.7	99.7	201	142.1	142.1	261	184.6	184.6
22	15.6	15.6	82	58.0	58.0	142	100.4	100.4	202	142.8	142.8	262	185.3	185.3
23	16.3	16.3	83	58.7	58.7	143	101.1	101.1	203	143.5	143.5	263	186.0	186.0
24	17.0	17.0	84	59.4	59.4	144	101.8	101.8	204	144.2	144.2	264	186.7	186.7
25	17.7	17.7	85	60.1	60.1	145	102.5	102.5	205	145.0	145.0	265	187.4	187.4
26	18.4	18.4	86	60.8	60.8	146	103.2	103.2	206	145.7	145.7	266	188.1	188.1
27	19.1	19.1	87	61.5	61.5	147	103.9	103.9	207	146.4	146.4	267	188.8	188.8
28	19.8	19.8	88	62.2	62.2	148	104.7	104.7	208	147.1	147.1	268	189.5	189.5
29	20.5	20.5	89	62.9	62.9	149	105.4	105.4	209	147.8	147.8	269	190.2	190.2
30	21.2	21.2	90	63.6	63.6	150	106.1	106.1	210	148.5	148.5	270	190.9	190.9
31	21.9	21.9	91	64.3	64.3	151	106.8	106.8	211	149.2	149.2	271	191.6	191.6
32	22.6	22.6	92	65.1	65.1	152	107.5	107.5	212	149.9	149.9	272	192.3	192.3
33	23.3	23.3	93	65.8	65.8	153	108.2	108.2	213	150.6	150.6	273	193.0	193.0
34	24.0	24.0	94	66.5	66.5	154	108.9	108.9	214	151.3	151.3	274	193.7	193.7
35	24.7	24.7	95	67.2	67.2	155	109.6	109.6	215	152.0	152.0	275	194.5	194.5
36	25.5	25.5	96	67.9	67.9	156	110.3	110.3	216	152.7	152.7	276	195.2	195.2
37	26.2	26.2	97	68.6	68.6	157	111.0	111.0	217	153.4	153.4	277	195.9	195.9
38	26.9	26.9	98	69.3	69.3	158	111.7	111.7	218	154.1	154.1	278	196.6	196.6
39	27.6	27.6	99	70.0	70.0	159	112.4	112.4	219	154.9	154.9	279	197.3	197.3
40	28.3	28.3	100	70.7	70.7	160	113.1	113.1	220	155.6	155.6	280	198.0	198.0
41	29.0	29.0	101	71.4	71.4	161	113.8	113.8	221	156.3	156.3	281	198.7	198.7
42	29.7	29.7	102	72.1	72.1	162	114.5	114.5	222	157.0	157.0	282	199.4	199.4
43	30.4	30.4	103	72.8	72.8	163	115.3	115.3	223	157.7	157.7	283	200.1	200.1
44	31.1	31.1	104	73.5	73.5	164	116.0	116.0	224	158.4	158.4	284	200.8	200.8
45	31.8	31.8	105	74.2	74.2	165	116.7	116.7	225	159.1	159.1	285	201.5	201.5
46	32.5	32.5	106	75.0	75.0	166	117.4	117.4	226	159.8	159.8	286	202.2	202.2
47	33.2	33.2	107	75.7	75.7	167	118.1	118.1	227	160.5	160.5	287	202.9	202.9
48	33.9	33.9	108	76.4	76.4	168	118.8	118.8	228	161.2	161.2	288	203.6	203.6
49	34.6	34.6	109	77.1	77.1	169	119.5	119.5	229	161.9	161.9	289	204.3	204.3
50	35.4	35.4	110	77.8	77.8	170	120.2	120.2	230	162.6	162.6	290	205.1	205.1
51	36.1	36.1	111	78.5	78.5	171	120.9	120.9	231	163.3	163.3	291	205.8	205.8
52	36.8	36.8	112	79.2	79.2	172	121.6	121.6	232	164.0	164.0	292	206.5	206.5
53	37.5	37.5	113	79.9	79.9	173	122.3	122.3	233	164.8	164.8	293	207.2	207.2
54	38.2	38.2	114	80.6	80.6	174	123.0	123.0	234	165.5	165.5	294	207.9	207.9
55	38.9	38.9	115	81.3	81.3	175	123.7	123.7	235	166.2	166.2	295	208.6	208.6
56	39.6	39.6	116	82.0	82.0	176	124.4	124.4	236	166.9	166.9	296	209.3	209.3
57	40.3	40.3	117	82.7	82.7	177	125.2	125.2	237	167.6	167.6	297	210.0	210.0
58	41.0	41.0	118	83.4	83.4	178	125.9	125.9	238	168.3	168.3	298	210.7	210.7
59	41.7	41.7	119	84.1	84.1	179	126.6	126.6	239	169.0	169.0	299	211.4	211.4
60	42.4	42.4	120	84.9	84.9	180	127.3	127.3	240	169.7	169.7	300	212.1	212.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

FOR 45 DEGREES.

TABLE 6.

NATURAL COSINES.													TABLE 6.
#	0°		1°		2°		3°		4°		5°		
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	
0	000000	0	999848	0	999391	0	998630	0	997564	0	996195	0	
1	00	0	843	0	881	0	614	0	544	0	6169	0	
2	00	0	837	0	870	0	599	1	523	1	6144	1	
3	00	0	832	0	860	1	584	1	503	1	6118	1	
4	999999	0	827	0	850	1	568	1	482	1	6093	2	
5	99	0	821	0	839	1	552	1	462	2	6067	2	
6	99	0	816	1	828	1	537	2	441	2	6041	3	
7	99	0	810	1	818	1	521	2	420	3	6015	3	
8	97	1	804	1	807	1	506	2	399	3	5989	3	
9	97	1	799	1	796	2	489	2	378	3	5963	4	
10	96	1	793	1	785	2	473	3	357	4	5937	4	
11	999995	1	999787	1	999274	2	998457	3	997336	4	995911	5	
12	94	1	781	1	763	2	441	3	315	4	584	5	
13	93	1	774	1	752	2	425	4	293	5	588	6	
14	92	1	768	1	740	3	408	4	272	5	582	6	
15	91	1	762	2	729	3	392	4	250	5	585	7	
16	89	1	756	2	718	3	375	4	229	6	578	7	
17	88	1	749	2	706	3	359	4	207	6	572	7	
18	86	1	743	2	694	3	342	5	185	6	575	8	
19	85	1	736	2	683	4	325	5	163	7	568	8	
20	83	1	729	2	671	4	308	5	141	7	571	9	
21	999981	1	999732	2	999159	4	998291	6	997119	7	995644	9	
22	80	2	716	2	647	4	274	6	7097	8	617	10	
23	78	2	709	2	635	4	257	6	7075	8	589	10	
24	76	2	701	3	623	5	240	7	7053	8	562	11	
25	74	2	694	3	611	5	223	7	7030	9	535	11	
26	71	2	687	3	598	5	205	7	7008	9	507	11	
27	69	2	680	3	586	5	188	8	6985	10	480	12	
28	67	2	673	3	573	5	170	8	6963	10	452	12	
29	64	2	665	3	561	6	153	8	6940	11	424	13	
30	62	2	657	3	548	6	135	9	6917	11	396	14	
31	999959	2	999650	4	999036	7	998117	9	996895	12	995386	15	
32	57	2	642	4	8023	7	8069	10	572	13	340	15	
33	54	2	634	4	8010	7	8081	10	549	13	312	15	
34	51	2	626	4	8097	8	8063	11	525	14	284	16	
35	48	2	618	4	8084	8	8045	11	502	14	256	17	
36	45	2	610	5	8071	8	8027	11	479	15	227	18	
37	42	2	602	5	8057	9	8008	12	456	15	199	18	
38	39	2	594	5	8044	9	7990	12	432	16	171	19	
39	36	2	585	5	8031	9	7972	12	409	16	142	19	
40	32	2	577	6	8017	9	7953	13	386	16	113	20	
41	999929	2	999568	6	998904	10	997934	13	996661	17	995084	20	
42	225	2	560	6	890	10	916	13	637	17	5056	21	
43	222	2	551	6	876	10	897	14	614	17	5027	21	
44	218	2	542	6	862	10	878	14	590	18	4998	21	
45	214	3	534	6	848	11	859	14	566	18	4969	22	
46	211	3	525	6	834	11	840	15	541	19	4939	22	
47	207	3	516	7	820	11	821	15	517	19	4910	23	
48	203	3	507	7	806	11	802	15	493	20	4881	23	
49	198	3	497	7	792	11	782	16	469	20	4851	24	
50	194	3	488	7	778	12	763	16	444	20	4822	25	
51	999890	3	999479	7	998763	12	997743	16	996420	21	994792	25	
52	886	3	469	7	749	12	724	16	395	21	763	26	
53	881	3	460	7	734	12	704	17	370	22	735	26	
54	877	3	451	8	719	13	684	17	345	22	708	27	
55	872	3	441	8	705	13	663	17	320	22	673	27	
56	867	3	431	8	690	13	645	18	295	23	648	28	
57	863	3	421	8	675	14	625	18	270	23	613	28	
58	858	3	411	8	660	14	605	19	245	24	588	29	
59	853	3	401	8	645	14	584	19	220	24	563	29	
60	848	4	391	9	630	14	564	19	195	24	538	30	

TABLE G. NATURAL COSINES.														87
°	6°		7°		8°		9°		10°		11°		Parts for "	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "		
0	994522	0	992546	0	990268	0	987688	0	984808	0	981627	0		
1	491	1	511	1	0228	1	643	1	757	1	572	1		
2	461	1	475	1	0187	1	597	1	707	2	516	2		
3	430	2	439	2	0146	2	551	2	656	3	460	3		
4	400	2	404	2	0106	3	506	3	606	3	405	4		
5	369	3	368	3	0065	3	460	4	554	4	349	5		
6	338	3	332	4	0024	4	414	5	503	5	293	6		
7	307	4	296	4	989983	5	368	6	452	6	237	7		
8	276	4	260	5	9942	6	322	7	401	7	181	7		
9	245	5	224	6	9900	6	275	8	350	8	124	8		
10	214	5	187	6	9859	7	229	8	299	9	068	9		
11	994182	6	992151	7	989818	8	987183	9	984247	9	981012	10		
12	4151	6	2115	7	776	8	7136	10	4196	10	0955	11		
13	4120	7	2078	8	735	9	7090	11	4144	11	0899	12		
14	4088	7	2042	9	693	10	7043	12	4092	12	0842	13		
15	4056	8	2005	9	651	10	6996	12	4041	13	0785	14		
16	4025	8	1968	10	610	11	6950	13	3989	14	0729	15		
17	3993	9	1931	10	568	12	6903	13	3937	15	0672	16		
18	3961	9	1894	11	526	12	6856	14	3885	16	0615	17		
19	3929	10	1857	12	484	13	6809	15	3833	16	0558	18		
20	3897	10	1820	12	442	14	6762	15	3781	17	0501	19		
21	993865	11	991783	13	989390	14	986714	16	983729	18	980443	20		
22	833	11	746	13	357	15	667	17	676	19	0386	21		
23	800	12	709	14	315	16	620	18	624	20	0329	22		
24	768	13	671	15	272	17	572	19	572	21	0271	23		
25	736	13	634	15	230	17	525	19	519	22	0214	24		
26	703	14	596	16	187	18	477	20	466	22	0156	25		
27	670	14	559	17	145	19	429	21	414	23	0098	26		
28	638	15	521	17	102	19	382	22	361	24	0041	27		
29	605	15	483	18	059	20	334	23	308	25	97983	28		
30	572	16	445	19	016	21	286	24	255	26	9925	29		
31	993539	17	991407	20	988973	22	986238	25	983202	27	979867	30		
32	506	18	369	21	930	23	6189	26	3149	28	809	31		
33	473	19	331	22	887	24	6141	27	3096	29	750	32		
34	440	19	292	22	843	25	6093	28	3042	30	692	33		
35	406	20	254	23	800	26	6045	29	2989	31	634	34		
36	373	21	216	24	756	26	5996	30	2935	32	575	35		
37	339	21	177	24	713	27	5948	31	2882	33	517	36		
38	306	22	138	25	669	28	5899	32	2828	34	458	37		
39	272	22	100	26	626	28	5850	33	2774	35	399	38		
40	238	23	061	26	582	29	5801	33	2721	36	341	39		
41	993205	23	991022	27	988538	30	985752	34	982667	37	979282	40		
42	3171	24	953	28	494	31	704	35	613	38	9223	41		
43	3137	24	914	28	450	32	654	35	559	39	9164	42		
44	3103	25	875	29	406	32	605	36	505	40	9105	43		
45	3069	25	836	30	362	33	556	37	450	41	9046	44		
46	3034	26	797	30	317	34	507	38	398	41	8986	45		
47	3000	27	757	31	273	35	457	39	342	42	8927	46		
48	2966	28	718	32	228	35	408	40	287	43	8867	47		
49	2931	28	678	32	184	36	358	41	233	44	8808	48		
50	2896	29	639	33	139	37	300	42	178	45	8748	49		
51	992862	29	990629	34	989005	38	985259	42	982123	46	978689	50		
52	847	30	589	34	8050	38	5209	43	2069	47	629	51		
53	792	30	549	35	7605	39	5159	44	2014	48	569	52		
54	757	31	510	36	7160	40	5109	45	1959	49	508	53		
55	722	31	469	36	7915	41	5059	45	1904	50	448	54		
56	687	32	429	37	7870	41	5009	46	1849	50	389	55		
57	652	32	389	38	7825	42	4959	47	1793	51	329	56		
58	617	33	349	38	7779	43	4909	48	1738	52	269	57		
59	582	34	309	39	7734	44	4859	49	1683	53	209	58		
60	546	34	268	39	7688	44	4808	50	1627	54	149	59		

88		NATURAL COSINES.										[TABLE 6.]	
°	'	12°		13°		14°		15°		16°		17°	
		Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0		978148	0	974370	0	970296	0	965926	0	961262	0	956305	0
1		8087	1	4305	1	0225	1	850	1	1182	1	6220	1
2		8026	2	4239	2	0155	2	773	2	1101	2	6135	2
3		7966	3	4173	3	0084	3	700	4	1021	4	6049	4
4		7905	4	4108	4	0014	5	624	5	0940	5	5964	5
5		7844	5	4042	6	969943	6	548	6	0860	7	5879	7
6		7783	6	3976	7	9872	7	473	8	0779	8	5793	8
7		7722	7	3910	8	9801	8	397	9	0698	9	5707	10
8		7661	8	3844	9	9730	9	321	10	0618	11	5622	11
9		7600	9	3778	10	9659	10	245	11	0537	12	5536	12
10		7539	10	3712	11	9588	12	169	13	0456	14	5450	14
11		977477	11	973645	13	969517	13	965093	14	960375	15	955364	16
12		7416	12	579	14	9445	14	5016	15	0294	16	5378	17
13		7354	13	512	15	9374	15	4940	16	0213	18	5192	19
14		7293	14	446	16	9302	16	4864	18	0131	19	5106	20
15		7231	15	379	17	9231	18	4787	19	0050	20	5020	22
16		7169	16	313	18	9159	19	4711	20	959968	22	4934	23
17		7108	17	246	19	9088	20	4634	21	9887	23	4847	24
18		7046	18	179	20	9016	21	4557	23	9805	24	4761	26
19		6984	19	112	21	8944	22	4481	24	9724	26	4674	27
20		6922	20	045	22	8872	24	4404	26	9642	27	4588	29
21		976859	22	972978	24	968900	25	964327	27	959560	28	954501	30
22		797	23	911	25	728	26	4250	28	9478	30	4414	32
23		735	24	843	26	656	27	4173	29	9396	31	4327	33
24		672	25	776	27	583	28	4095	31	9314	32	4240	35
25		610	26	708	28	511	30	4018	32	9232	34	4153	36
26		547	27	641	29	438	31	3941	33	9150	35	4066	37
27		485	28	573	30	366	32	3863	34	9067	36	3979	39
28		422	29	506	31	293	33	3786	36	8985	38	3892	40
29		359	30	438	32	220	34	3708	37	8902	39	3804	42
30		296	31	370	34	148	36	3631	38	8820	41	3717	44
31		976233	32	972302	35	968075	37	963553	40	958737	43	953829	45
32		6170	33	2234	36	8002	38	3475	42	8654	44	3542	47
33		6107	35	2166	38	7929	40	3397	43	8572	46	3454	48
34		6044	36	2098	39	7856	41	3319	44	8489	47	3366	50
35		5980	37	2029	40	7783	43	3241	46	8406	49	3279	51
36		5917	38	1961	41	7709	44	3163	47	8323	50	3191	53
37		5853	39	1893	42	7636	45	3084	48	8239	51	3103	55
38		5790	40	1824	44	7562	47	3006	49	8156	53	3015	56
39		5726	41	1755	45	7489	48	2928	51	8073	54	2926	58
40		5662	42	1687	46	7415	49	2849	52	7990	55	2838	59
41		975599	43	971618	47	967342	50	962770	53	957906	57	952750	61
42		535	44	1549	48	7268	52	692	55	823	58	2662	62
43		471	45	1480	49	7194	53	613	56	739	59	2573	64
44		407	46	1411	50	7120	54	534	57	655	61	2484	65
45		342	47	1342	52	7046	55	455	59	571	62	2396	67
46		278	49	1273	53	6972	57	376	60	488	64	2307	68
47		214	50	1204	54	6898	58	297	61	404	65	2218	70
48		149	51	1134	55	6823	59	218	63	320	66	2129	71
49		085	52	1065	56	6749	60	139	64	235	68	2040	73
50		020	53	0995	57	6675	62	059	65	151	69	1951	74
51		974956	54	970926	59	966800	63	961980	67	957067	71	951862	76
52		891	55	856	60	6526	64	901	68	6983	72	773	77
53		826	56	786	61	6451	65	821	69	6808	74	694	79
54		761	57	717	62	6376	66	741	71	6814	75	604	80
55		696	58	647	63	6301	68	662	72	6729	77	506	82
56		631	59	577	64	6226	69	582	73	6644	78	415	83
57		566	60	507	65	6151	70	502	75	6560	80	326	84
58		501	61	436	67	6076	72	422	76	6475	81	236	85
59		436	62	366	68	6001	73	342	78	6390	82	146	86
60		370	64	296	69	5926	74	262	79	6305	83	55	87

TABLE 6.]

NATURAL COSINES.

89

°	18°		19°		20°		21°		22°		23°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	951057	0	945519	0	939893	0	933580	0	927184	0	920506	0
1	0967	2	5424	2	9593	2	3476	2	7075	2	0391	2
2	0877	3	5329	3	9494	3	3372	4	6966	4	0277	4
3	0787	5	5234	5	9394	5	3267	5	6857	5	0164	6
4	0696	6	5139	6	9294	7	3163	7	6747	7	0050	8
5	0606	8	5044	8	9194	8	3058	9	6638	9	91938	10
6	0516	9	4949	10	9094	10	2954	11	6529	11	9822	11
7	0425	11	4854	11	8994	12	2849	12	6419	13	9707	13
8	0335	12	4758	13	8894	13	2744	14	6310	15	9593	15
9	0244	14	4663	14	8794	15	2639	16	6200	17	9479	17
10	0154	15	4568	16	8694	17	2534	18	6090	18	9364	19
11	950063	17	944472	18	938593	18	932429	19	925981	20	919250	21
12	949972	18	4376	19	8493	20	2324	21	5871	22	9135	23
13	9881	20	4281	21	8393	22	2219	23	5761	24	9021	25
14	9790	21	4185	22	8292	23	2113	25	5651	26	8906	27
15	9699	23	4089	24	8191	25	2008	26	5541	28	8791	29
16	9608	24	3993	26	8091	27	1902	28	5430	29	8676	31
17	9517	26	3897	27	7990	28	1797	30	5320	31	8561	33
18	9426	27	3801	29	7889	30	1691	32	5210	33	8446	35
19	9334	29	3705	30	7788	32	1586	33	5099	35	8331	37
20	9243	30	3609	32	7687	34	1480	35	4989	37	8216	38
21	948151	32	943512	34	937596	35	931374	37	924878	39	918101	40
22	9090	33	3416	35	7435	37	1268	39	4768	40	7996	42
23	8968	35	3319	37	7389	39	1162	40	4657	42	7870	44
24	8876	36	3223	38	7282	40	1056	42	4546	44	7755	46
25	8784	38	3126	40	7181	42	9500	44	4435	46	7639	48
26	8692	39	3029	42	7079	44	8643	46	4324	48	7523	50
27	8600	41	2932	43	6977	46	8737	48	4213	50	7408	52
28	8508	42	2836	45	6876	47	8631	50	4102	52	7292	54
29	8416	44	2739	47	6774	49	8524	52	3991	54	7176	56
30	8324	46	2642	48	6672	51	8418	53	3880	56	7060	58
31	948231	48	942544	51	936570	53	930311	55	923768	58	916944	60
32	8139	50	2447	52	6468	55	8204	57	3657	60	6828	62
33	8046	51	2350	54	6366	57	8097	59	3545	62	6712	64
34	7954	53	2253	56	6264	58	7999	61	3434	64	6596	66
35	7861	54	2155	57	6162	60	7884	63	3322	65	6479	68
36	7768	56	2058	59	6060	62	7777	65	3210	67	6363	70
37	7676	57	1960	60	5957	63	7669	67	3098	69	6246	72
38	7583	59	1862	62	5855	65	7562	69	2987	71	6130	74
39	7490	61	1764	64	5752	67	7455	71	2875	73	6013	76
40	7397	62	1667	66	5650	69	7348	72	2762	75	5896	78
41	947304	64	941569	67	935547	70	929240	74	922650	77	915780	80
42	7210	65	1471	69	5444	72	9133	76	2538	79	5663	82
43	7117	67	1372	71	5341	74	9025	78	2426	81	5546	84
44	7024	68	1274	72	5238	75	8917	80	2313	83	5429	86
45	6930	70	1176	74	5135	77	8810	81	2201	84	5312	88
46	6837	71	1078	75	5032	79	8702	83	2088	86	5194	90
47	6743	73	0979	77	4929	81	8594	85	1976	88	5077	92
48	6649	75	0881	79	4826	82	8486	87	1863	90	4960	94
49	6556	76	0782	80	4722	84	8378	89	1750	92	4842	96
50	6462	78	0684	82	4619	86	8270	90	1638	94	4725	98
51	946388	79	940585	84	934515	87	928161	92	921525	96	914607	100
52	6274	81	0486	85	4412	89	8053	94	1412	98	4490	102
53	6180	82	0387	87	4308	91	7943	96	1299	100	4372	104
54	6085	84	0288	89	4205	93	7836	98	1185	101	4254	106
55	5991	85	0189	90	4101	95	7728	100	1072	103	4136	108
56	5897	87	0090	92	3997	96	7619	101	9590	105	4018	110
57	5802	88	9899	94	3893	98	7510	103	8460	107	3900	112
58	5708	90	9801	95	3789	100	7402	105	7332	109	3782	114
59	5613	92	9702	97	3685	101	7293	107	6619	110	3664	116
60	5519	93	9603	98	3580	103	7184	109	5505	112	3546	118

88		NATURAL COSINES.										[TABLE 8.]	
°	'	12°		13°		14°		15°		16°		17°	
		Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	978148	0	974370	0	970296	0	965926	0	961262	0	956305	0	951305
1	8067	1	4305	1	0225	1	850	1	1182	1	6220	1	6135
2	8026	2	4239	2	0155	2	775	2	1101	2	6135	2	6049
3	7986	3	4173	3	0084	3	700	4	1021	4	6049	4	5964
4	7906	4	4108	4	0014	5	624	5	0940	5	5964	5	5879
5	7844	5	4042	5	99943	6	548	6	0860	6	5879	6	5793
6	7783	6	3976	7	8872	7	473	8	0779	8	5793	7	5707
7	7722	7	3910	8	8801	8	397	9	0698	9	5707	8	5622
8	7661	8	3844	9	8730	9	321	10	0618	11	5622	9	5536
9	7600	9	3778	10	8659	10	245	11	0537	12	5536	10	5450
10	7539	10	3712	11	8588	12	169	13	0456	14	5450	11	5364
11	7477	11	973645	13	969517	13	965093	14	960375	15	955364	12	5278
12	7416	12	579	14	9445	14	5016	15	0294	16	5278	13	5192
13	7354	13	512	15	9374	15	4940	16	0213	17	5192	14	5106
14	7293	14	446	16	9302	16	4864	18	0131	19	5106	15	5020
15	7231	15	379	17	9231	18	4787	19	0050	20	5020	16	4934
16	7169	16	313	18	9159	19	4711	20	958968	22	4934	17	4847
17	7108	17	246	19	9088	20	4634	21	9887	23	4847	18	4761
18	7046	18	179	20	9016	21	4557	23	9805	24	4761	19	4674
19	6984	19	112	21	8944	22	4481	24	9724	26	4674	20	4588
20	6922	20	045	22	8872	24	4404	26	9642	27	4588	21	4501
21	976859	22	972978	24	968800	25	964327	27	959560	28	954501	22	4414
22	797	23	911	25	728	26	4250	28	9478	30	4414	23	4327
23	735	24	843	26	656	27	4173	29	9396	31	4327	24	4240
24	672	25	776	27	583	28	4095	31	9314	32	4240	25	4153
25	610	26	708	28	511	30	4018	32	9232	34	4153	26	4066
26	547	27	641	29	438	31	3941	33	9150	35	4066	27	3979
27	485	28	573	30	366	32	3863	34	9067	36	3979	28	3892
28	422	29	506	31	293	33	3786	36	8985	38	3892	29	3804
29	359	30	438	32	220	34	3708	37	8902	39	3804	30	3717
30	296	31	370	34	148	36	3631	38	8820	41	3717	31	3629
31	976233	32	972302	35	968075	37	963553	40	958737	43	953629	32	3542
32	6170	33	2234	36	8002	38	3475	42	8654	44	3542	33	3454
33	6107	35	2166	38	7929	40	3397	43	8572	46	3454	34	3366
34	6044	36	2098	39	7856	41	3319	44	8489	47	3366	35	3279
35	5980	37	2029	40	7783	43	3241	46	8406	49	3279	36	3191
36	5917	38	1961	41	7709	44	3163	47	8323	50	3191	37	3103
37	5853	39	1893	42	7636	45	3084	48	8239	51	3103	38	3015
38	5790	40	1824	44	7562	47	3006	49	8156	53	3015	39	2928
39	5726	41	1755	45	7489	48	2928	51	8073	54	2928	40	2839
40	5662	42	1687	46	7415	49	2849	52	7990	55	2839	41	2750
41	975599	43	971618	47	967342	50	962770	53	957906	57	952750	42	2662
42	535	44	1549	48	7268	52	692	55	823	58	2662	43	2573
43	471	45	1480	49	7194	53	613	56	739	59	2573	44	2484
44	407	46	1411	50	7120	54	534	57	655	61	2484	45	2396
45	342	47	1342	52	7046	55	455	59	571	62	2396	46	2307
46	278	49	1273	53	6972	57	376	60	488	64	2307	47	2219
47	214	50	1204	54	6898	58	297	61	404	65	2219	48	2129
48	149	51	1134	55	6823	59	218	63	320	66	2129	49	2040
49	83	52	1065	56	6749	60	139	64	235	68	2040	50	1951
50	020	53	0996	57	6675	62	069	65	151	69	1951	51	1862
51	974956	54	970926	59	966600	63	961980	67	957067	71	951862	52	1773
52	891	55	856	60	6526	64	901	68	6983	72	1773	53	1684
53	826	56	788	61	6451	65	821	69	6898	74	1684	54	1595
54	761	57	717	62	6376	66	741	71	6814	75	1595	55	1506
55	696	58	647	63	6301	68	662	72	6729	77	1506	56	1417
56	631	59	577	64	6226	69	582	73	6644	78	1417	57	1328
57	566	60	507	65	6151	70	502	75	6560	80	1328	58	1239
58	501	61	436	67	6076	72	422	76	6475	81	1239	59	1150
59	436	62	366	68	6001	73	342	78	6390	82	1150	60	1061
60	370	64	296	69	5926	74	262	79	6305	83	1061	61	0972

TABLE 6.]

NATURAL COSINES.

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°	18°		19°		20°		21°		22°		23°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	951057	0	945519	0	939693	0	933580	0	927184	0	920506	0
1	0867	2	5424	2	9593	2	3476	2	7075	2	0391	2
2	0877	3	5329	3	9494	3	3372	3	6966	4	0277	4
3	0787	5	5234	5	9394	5	3267	5	6857	5	0164	6
4	0696	6	5139	6	9294	7	3163	7	6747	7	0050	8
5	0606	8	5044	8	9194	8	3058	9	6638	9	919338	10
6	0516	9	4949	10	9094	10	2954	11	6529	11	9822	11
7	0425	11	4854	11	8994	12	2849	12	6419	13	9707	13
8	0335	12	4758	13	8894	13	2744	14	6310	15	9593	15
9	0244	14	4663	14	8794	15	2639	16	6200	17	9479	17
10	0154	15	4568	16	8694	17	2534	18	6090	18	9364	19
11	950063	17	944472	18	938593	18	932429	19	925981	20	919250	21
12	949972	18	4376	19	8493	20	2324	21	5871	22	9135	23
13	9881	20	4281	21	8393	22	2219	23	5761	24	9021	25
14	9790	21	4185	22	8292	23	2113	25	5651	26	8906	27
15	9699	23	4089	24	8191	25	2008	26	5541	28	8791	29
16	9608	24	3993	26	8091	27	1902	27	5430	29	8676	31
17	9517	26	3897	27	7990	28	1797	30	5320	31	8561	33
18	9426	27	3801	29	7889	30	1691	32	5210	33	8446	35
19	9334	29	3705	30	7788	32	1586	33	5099	35	8331	37
20	9243	30	3609	32	7687	34	1480	35	4989	37	8216	38
21	949151	32	943512	34	937586	35	931374	37	924878	39	918101	40
22	9060	33	3416	35	7435	37	1268	39	4768	40	7986	42
23	8968	35	3319	37	7333	39	1162	40	4657	42	7870	44
24	8876	36	3223	38	7232	40	1056	42	4546	44	7755	46
25	8784	38	3126	40	7131	42	9950	44	4435	46	7639	48
26	8692	39	3029	42	7029	44	9843	46	4324	48	7523	50
27	8600	41	2932	43	6927	46	9737	48	4213	50	7408	52
28	8508	42	2836	45	6826	47	9631	50	4102	52	7292	54
29	8416	44	2739	47	6724	49	9524	52	3991	54	7176	56
30	8324	46	2642	48	6622	51	9418	53	3880	56	7060	58
31	948231	48	942544	51	936570	53	930311	55	923768	58	916944	60
32	8139	50	2447	52	6408	55	9204	57	8657	60	6828	62
33	8046	51	2350	54	6306	57	9097	59	8545	62	6712	64
34	7954	53	2253	56	6204	58	8991	61	8434	64	6596	66
35	7861	54	2155	57	6102	60	8884	63	8322	65	6479	68
36	7768	56	2058	59	6000	62	8777	65	8210	67	6363	70
37	7676	57	1960	60	5897	63	8669	67	8098	69	6246	72
38	7583	59	1862	62	5795	65	8562	69	7987	71	6130	74
39	7490	61	1764	64	5692	67	8455	71	7875	73	6013	76
40	7397	62	1667	66	5589	69	8348	72	7762	75	5896	78
41	947304	64	941509	67	935547	70	929240	74	922650	77	915780	80
42	7210	65	1471	69	5444	72	9133	76	2538	79	5663	82
43	7117	67	1372	71	5341	74	9025	78	2426	81	5546	84
44	7024	68	1274	73	5238	75	8917	80	2313	83	5429	86
45	6930	70	1176	74	5135	77	8810	81	2201	84	5312	88
46	6837	71	1078	75	5032	79	8702	83	2088	86	5194	90
47	6743	73	9979	77	4929	81	8594	85	1976	88	5077	92
48	6649	75	9881	79	4826	82	8486	87	1863	90	4960	94
49	6556	76	9782	80	4722	84	8378	89	1750	92	4842	96
50	6462	78	9684	82	4619	86	8270	90	1638	94	4725	98
51	946368	79	940585	84	934515	87	928161	92	921525	96	914607	100
52	6274	81	9486	85	4412	89	8053	94	1412	98	4490	102
53	6180	82	9387	87	4308	91	7944	96	1299	100	4372	104
54	6085	84	9288	89	4205	93	7836	98	1185	101	4254	106
55	5991	85	9189	90	4101	95	7725	100	1072	103	4136	108
56	5897	87	9090	92	3997	96	7619	101	9598	105	4018	110
57	5802	88	8991	94	3893	98	7510	103	9486	107	3900	112
58	5708	90	8891	95	3789	100	7402	105	9372	109	3782	114
59	5613	92	8792	97	3685	101	7293	107	9259	110	3664	116
60	5519	93	8693	98	3580	103	7184	109	9145	112	3546	118

90		NATURAL COSINES.										TABLE 6.	
°	' "	24°		25°		26°		27°		28°		29°	
		Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0		913546	0	906396	0	898794	0	891007	0	882948	0	874620	0
1		8427	2	8185	2	7967	2	7674	2	7311	2	6874	2
2		3309	4	6062	4	8539	4	0742	4	2674	4	4338	4
3		3190	6	5919	6	8411	6	0610	6	2538	6	4198	6
4		8072	8	5-15	8	8283	8	0478	8	2401	9	4055	8
5		2953	10	5692	10	8156	11	0345	11	2264	11	3914	12
6		2834	12	5569	12	8028	13	0213	13	2127	13	3772	14
7		2715	14	5445	14	7900	15	0080	15	1990	15	3631	16
8		2597	16	5322	16	7772	17	989948	17	1853	18	3489	18
9		2478	18	5198	18	7643	19	9815	19	1716	21	3348	21
10		2358	20	5075	21	7515	21	9682	21	1578	23	3206	24
11		912239	22	49451	23	897387	23	889549	23	881441	25	873084	25
12		2120	24	4827	25	7258	26	9416	26	1304	27	2922	27
13		2001	26	4703	27	7130	28	9283	28	1166	30	2780	30
14		1882	28	4579	29	7001	30	9150	30	1028	32	2638	32
15		1762	30	4455	31	6873	32	9017	32	8891	34	2496	34
16		1643	32	4331	33	6744	34	8884	35	8753	37	2354	36
17		1523	34	4207	35	6615	36	8751	37	8615	39	2212	38
18		1403	36	4083	37	6486	38	8617	39	8477	41	2070	40
19		1284	38	3958	39	6358	40	8484	41	8339	43	1927	42
20		1164	40	3834	41	6229	43	8350	44	8191	46	1784	44
21		911044	42	363709	43	896099	45	888217	46	880063	48	871642	48
22		0924	44	3585	45	5970	47	8083	48	879925	52	1499	50
23		0804	46	3480	47	5941	49	7949	50	8787	54	1357	52
24		0684	48	3385	49	5712	52	7815	52	8649	56	1214	54
25		0564	50	3211	51	5582	54	7682	55	8510	58	1071	56
26		0443	52	3086	54	5453	57	7548	58	8372	60	928	58
27		0323	54	2961	56	5323	58	7413	60	8233	62	785	60
28		0202	56	2836	58	5194	60	7279	62	8095	64	642	62
29		0082	58	2711	60	5064	62	7145	64	7956	67	499	64
30		906961	60	2585	63	4934	65	7011	67	7817	69	356	66
31		909841	62	24240	65	894805	67	89877	69	878678	71	870212	71
32		9720	64	2335	67	4675	69	6742	71	8539	73	8069	73
33		9599	66	2209	69	4545	71	6608	74	8400	76	89996	75
34		9478	68	2084	71	4415	73	6473	76	8261	78	8782	78
35		9357	70	1958	73	4284	75	6338	78	8122	81	8638	81
36		9236	72	1833	75	4154	78	6204	81	7983	84	8495	84
37		9115	74	1707	77	4024	80	6069	83	7844	86	8351	86
38		8994	76	1581	79	3894	82	5934	85	7704	89	8207	89
39		8873	78	1455	81	3763	84	5799	87	7565	91	8064	91
40		8751	80	1329	84	3633	87	5664	90	7425	93	7920	93
41		908630	82	901203	86	895502	89	885529	92	877286	95	868779	95
42		8508	84	1077	88	3371	91	5394	94	7146	97	8602	97
43		8387	86	0851	90	3241	93	5258	96	7006	100	8467	100
44		8265	88	0825	92	3110	95	5123	98	6867	102	8342	102
45		8143	90	0698	95	2979	97	4988	101	6727	105	8219	105
46		8021	92	0572	97	2848	100	4852	103	6587	107	8094	107
47		7900	94	0445	99	2717	102	4717	105	6447	109	7976	109
48		7778	96	0319	101	2586	104	4581	107	6307	112	7857	112
49		7655	98	0192	103	2455	106	4445	110	6167	114	7737	114
50		7533	100	0065	105	2323	108	4310	112	6026	117	7616	117
51		907411	102	899939	107	892192	111	884174	114	875886	119	867331	119
52		7289	104	9812	109	2061	113	4038	116	5746	122	7197	122
53		7167	106	9685	111	1929	115	3902	119	5605	124	7042	124
54		7044	109	9558	113	1798	117	3766	121	5465	126	6897	126
55		6922	111	9431	116	1669	119	3630	124	5324	129	6752	129
56		6799	113	9304	118	1534	122	3493	126	5183	131	6607	131
57		6676	115	9176	120	1402	124	3357	129	5042	133	6461	133
58		6554	117	9049	122	1271	126	3221	131	4902	136	6316	136
59		6431	119	8922	124	1139	129	3084	133	4761	138	6170	138
60		6308	121	8794	127	1007	131	2948	136	4620	140	6024	140

30°		31°		32°		33°		34°		35°	
Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "
866025	0	857167	0	848048	0	838671	0	829088	0	819152	0
5880	2	7017	3	7894	3	8512	3	8875	3	8985	3
5734	5	6868	5	7740	5	8354	5	8712	6	8816	6
5589	7	6718	8	7585	8	8195	8	8549	8	8651	9
5443	9	6567	10	7431	10	8036	11	8386	11	8484	11
5297	12	6417	13	7277	13	7878	13	8223	14	8317	14
5151	15	6267	15	7122	16	7719	16	8060	16	8150	17
5006	17	6117	17	6967	18	7560	19	7897	19	7982	20
4860	19	5966	20	6813	20	7401	22	7734	22	7815	23
4713	22	5816	22	6658	23	7242	24	7571	25	7648	25
4567	24	5666	25	6503	26	7083	27	7407	27	7480	28
864421	27	855515	27	846348	28	836924	29	827344	30	817313	31
4275	29	5364	30	6193	31	6764	32	7081	33	7145	34
4128	32	5214	32	6038	33	6605	35	6917	36	6977	36
3982	34	5063	35	5883	36	6446	38	6753	38	6809	39
3836	37	4912	38	5728	39	6286	40	6590	41	6642	42
3690	39	4761	40	5573	41	6127	43	6426	44	6474	44
3542	41	4610	43	5417	44	5967	46	6262	47	6306	47
3396	44	4459	45	5262	47	5807	48	6098	49	6138	50
3249	46	4308	47	5106	49	5648	51	5934	52	5970	53
3102	49	4156	50	4951	52	5488	54	5770	55	5801	56
862355	51	854005	52	844795	54	835328	56	825506	57	815633	58
2808	54	3854	55	4640	57	5108	59	5442	60	5465	61
2661	56	3702	57	4484	60	5008	62	5278	63	5296	64
2514	59	3551	60	4328	62	4848	65	5113	65	5128	67
2366	61	3399	62	4172	65	4688	67	4949	68	4959	70
2219	63	3248	65	4016	68	4527	70	4785	71	4791	73
2072	66	3096	67	3860	72	4367	72	4620	73	4622	76
1924	68	2944	70	3704	74	42.7	75	4456	76	4453	79
1777	71	2792	73	3548	76	4046	78	4291	79	4284	82
1629	74	2640	76	3391	78	3886	81	4126	82	4116	84
861482	77	852488	78	843235	81	833725	84	823961	84	813947	87
1334	80	2396	81	3079	84	3565	87	3797	87	3778	90
1186	82	2184	83	2922	87	3404	90	3632	90	3608	93
1038	84	2032	85	2766	90	3243	93	3467	93	3439	96
0890	87	1879	88	2609	92	3082	96	3302	96	3270	98
0742	89	1727	90	2452	94	2921	98	3136	99	3101	101
0594	92	1575	93	2296	97	2760	101	2971	102	2931	104
0446	94	1422	96	2139	99	2599	103	2806	105	2762	107
0298	97	1269	99	1982	102	2438	106	2641	108	2592	110
0149	99	1117	102	1825	105	2277	108	2475	111	2423	113
860001	102	850994	105	841608	108	832115	111	822310	114	812253	115
859852	103	0811	107	1511	111	1954	114	2144	116	2084	118
9704	106	0658	109	1354	113	1793	116	1978	119	1914	121
9555	109	0505	111	1196	115	1631	119	1813	122	1744	124
9406	112	0352	114	1039	119	1470	121	1647	125	1574	127
9258	114	0199	117	0882	121	1308	124	1481	128	1404	130
9109	116	0046	119	0724	123	1146	127	1315	131	1234	133
8960	118	848693	122	0567	126	0984	129	1149	134	1064	136
8811	121	9739	125	0409	128	0823	132	0983	136	0894	139
8662	124	9586	128	0251	131	0661	135	0817	139	0723	142
858513	126	849433	131	840094	134	830499	138	820651	142	810553	144
8364	129	9279	133	839936	136	0337	141	0485	145	0393	147
8214	131	9125	135	82778	139	0174	143	0318	147	0212	150
8065	134	8972	138	81620	142	0012	146	0152	150	0042	153
7916	136	8818	140	80462	144	829850	148	819985	153	809871	156
7766	139	8664	143	79.04	147	9698	151	9619	156	9500	158
7616	142	8510	145	9146	150	9625	154	9652	158	9530	162
7467	145	8356	148	8987	152	9363	158	9486	161	9369	164
7317	147	8202	151	8829	155	9200	159	9319	164	9189	167
7167	149	8048	153	8671	157	9038	162	9152	166	9017	170

°	36°	NATURAL COSINES		°
		Co-sine.	Parts for 1°	
0	806017	0	798336	0
1	8948	3	8460	1
2	8073	6	8283	2
3	8504	9	8110	3
4	8333	11	7935	4
5	8161	17	7759	5
6	7990	20	7584	6
7	7819	23	7408	7
8	7647	26	7233	8
9	7475	29	7057	9
10	7304	32	6882	10
11	807132	39	796706	11
12	6980	34	6530	12
13	6789	37	6354	13
14	6517	40	6175	14
15	6445	43	6002	15
16	6273	46	5826	16
17	6101	49	5650	17
18	5928	52	5473	18
19	5756	55	5297	19
20	5584	57	5121	20
21	805411	60	794944	21
22	5239	63	4768	22
23	5066	66	4591	23
24	4894	69	4415	24
25	4721	72	4238	25
26	4548	75	4061	26
27	4376	78	3884	27
28	4203	81	3707	28
29	4030	84	3530	29
30	3857	86	3353	30
31	803684	89	793176	31
32	3511	92	2969	32
33	3338	95	2822	33
34	3164	98	2644	34
35	2991	101	2467	35
36	2818	104	2290	36
37	2644	107	2112	37
38	2471	110	1935	38
39	2297	113	1757	39
40	2123	116	1579	40
41	801950	118	791401	41
42	1776	121	1224	42
43	1602	124	1046	43
44	1428	127	0868	44
45	1254	130	0690	45
46	1080	133	0512	46
47	0906	136	0333	47
48	0731	139	0155	48
49	0557	142	789777	49
50	0383	145	7798	50
51	800216	147	789620	51
52	0034	150	9441	52
53	799859	153	9263	53
54	9885	156	9084	54
55	9510	159	8905	55
56	9335	162	8727	56
57	9160	165	8548	57
58	8985	168	8369	58
59	8811	171	8190	59
60	8636	174	8011	60
		151	775791	
		154	8608	
		157	8426	
		160	8243	
		163	8060	
		166	7878	
		169	7695	
		172	7512	
		175	7329	
		178	7146	
		155	775791	
		158	8608	
		161	8426	
		164	8243	
		167	8060	
		170	7878	
		173	7695	
		176	7512	
		179	7329	
		182	7146	
		155	767725	
		158	7538	
		161	7352	
		164	7165	
		167	6979	
		170	6792	
		173	6605	
		176	6418	
		179	6231	
		182	6044	
		155	767725	
		158	7538	
		161	7352	
		164	7165	
		167	6979	
		170	6792	
		173	6605	
		176	6418	
		179	6231	
		182	6044	
		155	767725	
		158	7538	
		161	7352	
		164	7165	
		167	6979	
		170	6792	
		173	6605	
		176	6418	
		179	6231	
		182	6044	

NATURAL COSINES.

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2°	43°		44°		45°		46°		47°	
Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "	Co- sine.	Parts for "
0	731354	0	719340	0	707107	0	694658	0	681998	0
3	1155	3	9138	3	6901	3	4449	3	1786	4
7	0957	7	8896	7	6895	7	4240	7	1573	7
10	0758	10	8733	10	6489	10	4030	11	1380	10
13	0560	13	8531	14	6284	14	3821	14	1147	14
17	0361	16	8329	17	6078	17	3611	18	0934	18
20	0162	20	8126	20	5872	21	3402	21	0721	21
23	729963	23	7924	24	5666	24	3192	25	0508	25
26	9765	26	7721	27	5459	28	2983	28	0295	28
29	9566	29	7519	31	5253	31	2773	32	0081	32
33	9367	33	7316	34	5047	34	2563	35	679868	36
36	729168	38	717113	38	704841	38	692353	39	679655	39
39	8969	39	6911	41	4634	41	2143	42	9441	43
42	8770	42	6708	45	4428	45	1983	46	9228	46
45	8570	46	6505	48	4221	48	1723	49	9014	50
49	8371	50	6302	51	4015	52	1513	52	8801	53
52	8172	53	6099	55	3808	55	1303	56	8587	57
55	7972	56	5896	58	3601	59	1093	59	8373	60
58	7773	60	5693	62	3395	62	0882	63	8160	64
62	7573	63	5490	65	3188	66	0672	66	7946	67
65	7374	66	5286	68	2981	69	0462	70	7732	71
68	727174	70	715083	72	702774	73	690251	73	677518	74
71	6974	73	4880	75	2567	76	0041	77	7304	78
75	6775	76	4676	79	2360	80	689330	80	7090	81
78	6576	80	4473	82	2153	83	9620	84	6876	85
81	6375	83	4269	85	1946	86	9409	87	6662	88
84	6175	86	4068	88	1739	90	9198	91	6448	92
88	5975	90	3862	92	1531	93	8987	94	6233	96
91	5775	93	3658	96	1324	97	8776	98	6019	99
94	5575	96	3454	99	1117	100	8566	101	5805	103
98	5374	100	3250	102	0909	103	8355	105	5590	107
103	725174	104	713047	106	700702	107	688144	110	675376	111
106	4974	107	2843	109	0494	111	7932	113	5161	115
110	4773	110	2639	112	0287	114	7721	117	4947	118
113	4573	113	2434	116	0079	118	7510	120	4732	122
116	4372	117	2230	119	698871	121	7299	124	4517	125
119	4172	120	2026	123	9663	125	7088	127	4302	129
123	3971	123	1822	126	9455	128	6876	131	4088	133
126	3771	127	1617	130	9248	132	6665	134	3873	136
129	3570	130	1413	133	9040	135	6453	138	3658	140
132	3369	134	1209	137	8832	139	6242	141	3443	143
135	723168	137	711004	140	698623	142	686030	144	673228	147
139	2967	141	0799	143	8415	145	5818	148	3013	151
142	2766	144	0595	146	8207	149	5607	152	2797	154
145	2565	147	0390	150	7999	152	5395	156	2582	158
149	2364	150	0185	153	7790	156	5183	159	2367	161
152	2163	154	709981	157	7582	159	4971	163	2151	165
155	1962	157	9776	160	7374	163	4759	167	1936	169
158	1760	161	9571	164	7165	166	4547	170	1721	172
162	1559	164	9366	167	6957	170	4335	174	1505	176
165	1357	168	9161	171	6748	173	4123	177	1290	179
169	721156	171	708956	174	696539	177	683911	181	671074	183
172	0954	174	8750	177	6330	180	3698	184	0858	186
175	0753	177	8545	181	6122	184	3486	188	0642	190
178	0551	181	8340	184	5913	187	3274	191	0427	193
182	0349	184	8135	188	5704	191	3061	195	0211	197
185	0148	188	7929	191	5495	194	2849	198	669995	201
188	718946	191	7724	195	5286	198	2636	202	9779	204
191	9744	194	7518	198	5077	201	2424	205	9563	208
194	9542	197	7312	202	4868	205	2211	209	9347	211
197	9340	201	7107	205	4658	208	1998	212	9131	214

°	48°		49°		50°		51°		52°		53°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	669131	0	550599	0	542788	0	629320	0	515651	0	601515	0
1	8914	4	5840	4	2565	4	9094	4	5432	4	1559	4
2	8998	7	5820	7	2342	8	8868	8	5203	8	1381	8
3	8482	11	5400	11	2119	11	8842	11	4974	12	1118	12
4	8265	14	5180	15	1896	15	8416	15	4744	16	0888	16
5	8049	18	4961	19	1673	19	8189	19	4515	19	0603	19
6	7833	22	4741	22	1450	22	7963	23	4285	23	0401	23
7	7616	25	4521	26	1226	26	7737	26	4056	27	0188	27
8	7399	29	4301	30	1003	30	7510	30	3826	31	5990	31
9	7183	32	4081	33	0780	34	7284	34	3596	35	5772	35
10	6966	36	3861	37	0557	37	7057	38	3367	36	5549	36
11	666749	39	53641	41	640333	41	626830	42	513137	42	599955	42
12	6532	43	3421	44	0110	45	6604	45	2907	46	9094	46
13	6316	46	3200	48	639896	49	6377	49	2677	50	8771	50
14	6099	50	2990	52	9663	53	6150	53	2447	54	8558	54
15	5882	54	2760	55	9439	56	5923	57	2217	57	8345	57
16	5665	57	2539	59	9215	60	5697	61	1987	61	8132	61
17	5448	61	2319	63	8992	64	5470	64	1757	65	7919	65
18	5230	64	2098	66	8768	68	5243	68	1527	69	7705	69
19	5013	68	1878	70	8544	72	5016	72	1297	73	7492	73
20	4796	72	1657	73	8320	75	4789	76	1067	77	7279	77
21	664579	75	351437	77	638096	78	624561	80	610836	81	602055	81
22	4361	79	1216	81	7572	82	4334	84	0606	85	6895	85
23	4144	82	0995	85	7648	86	4107	88	0376	89	6680	89
24	3926	86	0774	89	7424	90	3880	92	0145	92	6465	92
25	3709	90	0553	93	7200	94	3652	95	59915	96	6250	96
26	3491	93	0332	96	6976	97	3425	99	5684	100	6035	100
27	3273	97	0111	100	6751	101	3197	103	5454	104	5820	104
28	3056	101	649590	103	6527	105	2970	107	5223	108	5605	108
29	2838	105	9669	107	6303	109	2742	111	4992	111	5390	111
30	2620	109	9448	110	6078	112	2515	114	4761	115	5175	115
31	662402	114	649227	115	635854	117	622257	119	608531	119	594599	119
32	2184	118	9.06	118	5629	121	2059	123	8300	123	573155	123
33	1966	121	8784	122	5405	124	1831	127	8069	127	551811	127
34	1748	125	8563	126	5180	128	1604	131	7838	131	530467	131
35	1530	128	8341	129	4955	131	1376	134	7607	136	509123	136
36	1312	132	8120	133	4731	134	1148	138	7376	139	487779	139
37	1094	136	7898	137	4506	138	0920	142	7145	143	466435	143
38	0875	139	7677	141	4281	142	0692	146	6914	147	445091	147
39	0657	143	7455	144	4056	146	0464	150	6682	151	423747	151
40	0439	146	7233	148	3831	150	0235	153	6451	154	402403	154
41	660220	150	647012	152	633606	153	620007	157	606220	158	592565	158
42	0002	154	6790	155	3381	157	619779	161	5988	162	571221	162
43	659783	157	6568	159	3156	161	9551	165	5757	166	549877	166
44	9565	161	6346	163	2931	165	9322	169	5526	170	528533	170
45	9346	164	6124	167	2705	169	9094	172	5294	174	507189	174
46	9127	168	5902	171	2480	172	8865	176	5062	178	485845	178
47	8908	172	5680	174	2255	176	8637	180	4831	182	464501	182
48	8690	175	5458	178	2029	180	8408	184	4599	186	443157	186
49	8471	179	5236	181	1804	183	8180	188	4367	190	421813	190
50	8252	183	5013	185	1578	187	7951	191	4136	194	400469	194
51	658033	17	644791	188	631353	191	617722	195	603904	197	589625	197
52	7814	190	4569	192	1127	195	7494	199	3672	201	568281	201
53	7594	194	4346	196	0902	199	7265	203	3444	205	546937	205
54	7375	197	4124	200	0676	202	7036	206	3208	209	525593	209
55	7156	201	3901	204	0450	206	6807	210	2976	213	504249	213
56	6937	204	3679	207	0224	210	6578	214	2744	217	482905	217
57	6717	208	3456	211	629908	214	6349	218	2512	220	461561	220
58	6498	212	3233	215	9772	218	6120	221	2280	224	440217	224
59	6279	215	3010	218	9546	221	5891	225	2047	228	418873	228
60	6059	219	2788	222	9320	225	5661	228	1815	231	397529	231

TAB. E 6.

NATURAL COSINES.

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°	54°		55°		56°		57°		58°		59°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	587785	0	573576	0	559193	0	544639	0	529919	0	515038	0
1	7550	4	3338	4	8952	4	4395	4	9673	4	4789	4
2	7315	8	3100	8	8710	8	4151	8	9426	8	4539	8
3	7079	12	2861	12	8469	12	3907	12	9179	12	4290	12
4	6844	16	2623	16	8225	16	3663	16	8932	17	4040	17
5	6608	20	2384	20	7987	20	3419	20	8685	21	3791	21
6	6372	24	2146	24	7745	24	3174	24	8438	25	3541	25
7	6137	28	1907	28	7504	28	2930	28	8191	29	3292	29
8	5901	32	1669	32	7262	32	2686	32	7944	33	3042	33
9	5665	36	1430	36	7021	36	2442	37	7697	37	2792	37
10	5429	39	1191	40	6779	40	2197	41	7450	41	2543	42
11	5185	43	9705	44	6537	45	541953	45	527203	45	512293	46
12	4959	47	0714	48	6296	49	1708	49	6956	49	2043	50
13	4722	51	0475	52	6054	53	1464	53	6709	54	1793	54
14	4486	55	0236	56	5812	57	1219	57	6461	58	1543	58
15	4250	59	569997	60	5570	61	0975	61	6214	62	1293	63
16	4014	63	9758	64	5328	65	0730	65	5967	66	1043	67
17	3777	67	9519	68	5086	69	0485	69	5719	70	0793	71
18	3541	71	9280	72	4844	73	0240	73	5472	74	0543	75
19	3305	75	9040	76	4602	77	539996	77	5224	78	0293	79
20	3069	79	8801	80	4360	81	9751	81	4977	82	0043	83
21	582582	83	568562	84	554118	85	539506	86	524729	87	509792	87
22	2596	87	8323	88	3876	89	9261	90	4481	91	9542	91
23	2360	91	8083	92	3634	93	9016	94	4234	95	9292	95
24	2123	95	7844	96	3392	97	8771	98	3986	99	9041	99
25	1886	99	7604	100	3149	101	8526	102	3738	103	8791	104
26	1650	103	7365	104	2907	105	8281	106	3490	107	8541	108
27	1413	107	7125	108	2664	109	8035	110	3242	111	8290	112
28	1176	111	6886	112	2422	113	7790	114	2995	115	8040	117
29	0940	115	6646	116	2180	117	7545	118	2747	119	7789	121
30	0703	118	6406	120	1937	122	7300	122	2499	124	7538	126
31	580466	122	566166	124	551694	126	537054	127	522251	128	507288	130
32	0229	126	5927	128	1452	130	6909	131	2002	132	7037	134
33	579992	130	5687	132	1209	134	6563	135	1754	136	6786	138
34	9755	134	5447	136	0968	138	6318	139	1506	141	6536	142
35	9518	138	5207	140	0724	142	6072	143	1258	145	6286	146
36	9281	142	4967	144	0481	146	5827	148	1010	149	6034	151
37	9044	146	4727	148	0238	150	5581	152	0761	153	5783	155
38	8807	150	4487	152	549995	154	5336	156	0513	158	5532	159
39	8570	154	4247	156	9752	158	5090	160	0265	162	5281	163
40	8332	158	4007	160	9509	162	4844	164	0016	166	5030	168
41	578095	162	563766	164	549266	166	534598	168	519768	170	504779	172
42	7858	166	3526	168	9023	171	4352	172	9519	174	4528	176
43	7620	170	3286	172	8780	175	4107	176	9271	178	4277	180
44	7383	174	3045	176	8536	179	3861	180	9022	182	4025	184
45	7145	178	2805	180	8293	183	3615	184	8773	186	3774	188
46	6908	182	2564	184	8050	187	3369	189	8525	190	3523	193
47	6670	186	2324	188	7807	191	3122	193	8276	195	3271	197
48	6432	190	2083	192	7563	195	2876	197	8027	199	3020	201
49	6195	194	1843	196	7320	199	2630	201	7778	203	2769	205
50	5957	198	1602	200	7076	203	2384	205	7529	207	2517	210
51	575719	202	561361	204	540833	207	532138	209	517280	212	502266	214
52	5481	206	1121	208	5689	211	1891	213	7031	216	2014	218
53	5243	210	0880	212	6346	215	1645	217	6782	220	1762	222
54	5005	214	0639	216	6102	219	1399	221	6533	224	1511	226
55	4767	218	0398	220	5858	223	1152	226	6284	228	1259	230
56	4529	222	0157	224	5615	227	0906	230	6035	233	1007	235
57	4291	226	590916	228	5371	231	0659	234	5786	237	0758	239
58	4053	230	9675	232	5127	235	0413	238	5537	241	0504	243
59	3815	234	9434	236	4883	239	0166	242	5287	245	0252	247
60	3576	237	9193	240	4639	243	529919	246	5038	249	0000	251

The image shows a close-up, angled view of a large, curved, and heavily worn page from an old book or document. The page is filled with dense, handwritten text in a cursive script, likely a ledger or account book. The text is arranged in columns and rows, though the perspective makes it difficult to read. The paper is discolored and shows signs of age and damage, particularly along the edges and in the center fold. A small portion of a red object, possibly a pen or pencil, is visible in the bottom left corner.

96		NATURAL COSINES.										TABLE 8.	
°	N	60°		61°		62°		63°		64°		65°	
		Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	500000	0	484810	0	469472	0	453991	0	438371	0	422618	0	406744
1	499748	4	4555	4	9215	4	3731	4	8110	4	2555	4	2555
2	499496	8	4301	8	8958	8	3472	8	7848	8	2301	8	2301
3	499244	12	4046	12	8701	12	3213	12	7587	12	2153	12	2153
4	498992	17	3792	17	8444	17	2954	17	7325	17	2000	17	2000
5	498740	21	3537	21	8187	21	2694	21	7063	21	1846	21	1846
6	498488	25	3282	25	7930	25	2435	25	6802	25	1692	25	1692
7	498236	30	3028	30	7673	30	2175	30	6540	30	1538	30	1538
8	497983	34	2773	34	7416	34	1916	34	6278	34	1384	34	1384
9	497731	38	2518	38	7158	38	1656	38	6017	38	1230	38	1230
10	497479	42	2263	42	6901	42	1397	42	5755	42	1076	42	1076
11	497226	46	2009	46	6644	46	1137	46	5493	46	9210	46	9210
12	496974	50	1754	50	6387	50	878	50	5231	50	7947	50	7947
13	496722	54	1499	54	6129	54	6018	54	4969	54	6684	54	6684
14	496469	58	1244	58	5872	58	3259	58	4707	58	5421	58	5421
15	496217	63	989	63	5615	63	4008	63	4445	63	4158	63	4158
16	495964	67	7334	67	5357	67	4750	67	4183	67	3900	67	3900
17	495711	71	4779	71	5100	71	2579	71	3921	71	3638	71	3638
18	495459	75	2224	75	4842	75	3319	75	3659	75	3376	75	3376
19	495206	79	47968	79	4585	79	3059	79	3397	79	3114	79	3114
20	494953	84	9713	84	4327	84	5799	84	3135	84	2852	84	2852
21	494701	88	479458	88	4069	88	48539	88	432873	88	417074	88	401275
22	4448	92	9203	92	3812	92	3279	92	2610	92	2210	92	1810
23	4193	96	8947	96	3554	96	3019	96	2345	96	1945	96	1545
24	3942	100	8692	100	3296	100	2759	100	2086	100	1686	100	1286
25	3689	105	8436	105	3038	105	2499	105	1823	105	1423	105	1023
26	3436	109	8181	109	2780	109	2259	109	1551	109	1151	109	751
27	3183	113	7926	113	2523	113	1979	113	1269	113	869	113	469
28	2930	117	7670	117	2265	117	1718	117	1036	117	636	117	236
29	2677	121	7414	121	2007	121	1458	121	774	121	374	121	74
30	2424	126	7159	126	1749	126	1198	126	511	126	111	126	11
31	492170	131	476903	131	461491	131	445938	131	430249	131	414500	131	400744
32	1917	135	6647	135	1233	135	5677	135	429686	135	414144	135	400388
33	1664	140	6392	140	1074	140	5417	140	40323	140	38764	140	37318
34	1411	144	6136	144	916	144	5156	144	3761	144	3616	144	34714
35	1157	148	5880	148	759	148	4896	148	3498	148	3353	148	3208
36	904	152	5624	152	600	152	4635	152	3235	152	3090	152	2945
37	650	156	5368	156	43942	156	4375	156	2972	156	2827	156	2682
38	397	161	5112	161	2833	161	4114	161	2610	161	2465	161	2320
39	143	165	4856	165	1425	165	3853	165	2347	165	2202	165	2057
40	489890	169	4600	169	9167	169	3593	169	2084	169	1939	169	1794
41	489636	173	474344	173	458906	173	443332	173	427621	173	411910	173	400744
42	9383	178	4088	178	3650	178	3071	178	2358	178	1814	178	1270
43	9129	182	3832	182	3391	182	2810	182	2095	182	1551	182	1007
44	8875	186	3576	186	3133	186	2550	186	1883	186	1339	186	795
45	8621	190	3320	190	2874	190	2289	190	1619	190	1075	190	531
46	8367	195	3063	195	2615	195	2029	195	1356	195	812	195	287
47	8114	199	2807	199	2357	199	1767	199	1093	199	568	199	243
48	7860	203	2551	203	2098	203	1506	203	830	203	289	203	199
49	7606	207	2294	207	1839	207	1245	207	551	207	140	207	115
50	7352	212	2038	212	1580	212	984	212	263	212	9	212	1
51	487098	216	471782	216	456322	216	440723	216	424990	216	409257	216	400744
52	6844	220	1825	220	1363	220	1062	220	726	220	285	220	141
53	6590	224	1569	224	1104	224	800	224	443	224	232	224	87
54	6335	229	1312	229	845	229	49939	229	4199	229	237	229	83
55	6081	233	1056	233	589	233	3678	233	3936	233	241	233	79
56	5827	237	800	237	333	237	241	243	2673	237	245	237	75
57	5573	241	544	241	77	241	155	247	2409	241	249	241	71
58	5318	245	288	245	51	245	88	251	2146	245	254	245	67
59	5064	249	32	249	25	249	25	251	251	251	251	249	63
60	4810	254	472	254	391	254	251	251	251	251	251	254	59

TABLE 6.]

NATURAL COSINES.

97

66°		67°		68°		69°		70°		71°	
Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
407737	0	390731	0	374607	0	358368	0	342020	0	325568	0
6471	4	0463	4	4337	5	8096	5	1747	5	5293	5
6205	9	0196	9	4067	9	7825	9	1473	9	5018	9
5939	13	389928	13	3797	14	7553	14	1200	14	4743	14
5673	18	9660	18	3528	18	7281	18	0927	18	4468	18
5408	22	9392	22	3258	23	7010	23	0653	23	4193	23
5142	27	9124	27	2988	27	6738	27	0380	27	3917	27
4876	31	8856	31	2718	32	6466	32	0106	32	3642	32
4610	36	8588	36	2448	36	6194	36	339533	36	3367	37
4344	40	8320	40	2178	41	5923	41	9559	41	3092	41
4078	44	8052	45	1908	45	5651	45	9285	46	2816	46
403811	49	387784	49	371638	50	355379	50	339012	50	322541	51
3545	53	7516	54	1368	54	5107	54	8738	55	2266	55
3279	58	7247	58	1098	59	4835	59	8464	59	1990	60
3013	62	6979	63	0828	63	4563	63	8191	64	1715	64
2747	66	6711	67	0557	68	4291	68	7917	68	1440	69
2480	71	6443	72	0287	72	4019	73	7643	73	1164	74
2214	76	6174	76	0017	77	3747	77	7369	78	0889	78
1948	80	5906	81	369747	81	3475	82	7095	82	0613	83
1681	85	5638	85	9477	86	3203	87	6821	87	0337	87
1415	89	5369	89	9206	90	2931	91	6548	91	0062	92
401149	94	385101	93	368936	95	352658	96	336274	96	319786	96
0882	98	4832	98	8665	100	2386	100	6000	100	9511	101
0616	103	4564	102	8395	104	2114	105	5726	105	9235	106
0349	107	4295	107	8125	108	1842	109	5452	109	8959	110
0083	112	4027	111	7854	113	1569	114	5178	114	8684	115
399816	116	3758	116	7584	117	1297	118	4903	118	8408	119
9549	121	3490	121	7313	122	1025	123	4629	123	8132	124
9283	125	3221	125	7043	126	0752	127	4355	127	7856	128
9016	129	2952	130	6772	131	0480	132	4081	132	7581	133
8749	133	2683	134	6501	135	0207	136	3807	137	7305	138
398482	138	382415	139	368231	140	349635	141	335533	142	317029	143
8216	142	2146	143	5960	144	9662	145	3258	146	6753	147
7949	147	1877	148	5689	149	9390	150	2984	151	6477	152
7682	151	1608	152	5418	153	9117	155	2710	155	6201	157
7415	156	1339	157	5148	158	8845	159	2436	160	5925	161
7148	160	1070	161	4877	162	8572	164	2161	165	5649	166
6881	165	0801	166	4606	167	8299	168	1887	169	5373	171
6614	169	0532	170	4335	171	8027	173	1612	173	5097	175
6347	174	0263	175	4064	176	7754	177	1338	178	4821	180
6080	178	379944	179	3793	180	7481	182	1063	183	4545	184
395813	182	379725	184	363522	185	347209	186	330789	187	314269	189
5546	187	9456	188	3251	189	6936	191	0514	192	3993	193
5278	191	9187	193	2980	194	6663	195	0240	197	3716	198
5011	196	8918	197	2709	198	6390	200	329965	201	3440	202
4744	200	8649	202	2438	203	6117	205	9691	206	3164	207
4477	205	8379	206	2167	207	5844	209	9416	210	2888	212
4209	209	8110	211	1896	212	5571	214	9141	215	2611	216
3942	214	7841	215	1625	216	5298	218	8867	220	2335	221
3675	218	7571	220	1353	221	5025	223	8592	224	2059	225
3407	223	7302	224	1082	226	4752	228	8317	229	1782	230
395140	227	377033	229	360811	230	344479	232	328042	234	311506	235
2872	231	6763	233	0540	235	4206	237	7768	238	1229	239
2605	236	6494	238	0268	239	3933	241	7493	243	0953	244
2337	240	6224	242	359997	244	3660	246	7218	247	0676	248
2070	245	5955	247	9725	248	3387	250	6943	252	0400	253
1802	249	5685	251	9454	253	3113	255	6668	256	0123	258
1534	254	5416	256	9183	257	2840	259	6393	261	36947	262
1267	258	5146	260	8911	262	2567	264	6118	265	9570	267
0999	263	4876	265	8640	266	2294	268	5843	270	9294	271
0731	267	4607	269	8368	271	2020	273	5568	274	9017	276

°	72°		73°		74°		75°		76°		77°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0	309017	0	292372	0	275637	0	258819	0	241922	0	224950	0
1	8740	5	2094	5	5358	5	8538	5	1640	5	4695	5
2	8464	9	1815	9	5078	9	8257	9	1357	9	4384	9
3	8187	14	1537	14	4798	14	7976	14	1075	14	4101	14
4	7910	18	1259	18	4519	18	7695	18	7993	18	3817	18
5	7633	23	0981	23	4239	23	7414	23	0510	24	3534	23
6	7357	28	0702	28	3959	28	7133	28	0228	28	3250	28
7	7080	32	0424	32	3679	33	6852	33	23946	33	2967	32
8	6803	37	0146	37	3400	37	6571	37	9663	38	2683	37
9	6526	42	28987	42	3120	42	6289	42	8381	43	2398	42
10	6249	46	9589	46	2840	47	6008	47	9098	47	2116	47
11	305972	51	289310	51	272560	51	255727	52	239816	52	221802	51
12	5695	55	9032	55	2280	56	5446	56	8534	57	1545	56
13	5418	60	8753	60	2000	61	5165	61	8251	61	1260	61
14	5141	65	8475	65	1720	65	4883	66	7968	66	0961	66
15	4864	69	8196	70	1440	70	4602	70	7686	71	0677	70
16	4587	74	7918	74	1161	75	4321	75	7403	75	0414	75
17	4310	78	7639	79	0881	79	4039	80	7121	80	0130	80
18	4033	83	7361	84	0600	84	3758	84	6838	85	21846	84
19	3756	88	7082	88	0320	89	3477	89	6556	90	0602	89
20	3479	92	6803	93	0040	93	3195	94	6273	94	2279	93
21	303202	97	286525	98	269760	98	252914	98	235990	99	213865	98
22	2924	102	6246	102	9480	103	2632	103	5708	104	8711	103
23	2647	106	5967	107	9200	107	2351	108	5425	108	8427	107
24	2370	111	5688	112	8920	112	2069	113	5142	113	8143	112
25	2093	116	5410	116	8640	117	1788	117	4859	118	7859	117
26	1815	120	5131	121	8359	121	1506	122	4577	123	7573	122
27	1538	125	4852	126	8079	126	1225	127	4294	127	7289	126
28	1261	130	4573	130	7799	131	0943	131	4011	132	7005	131
29	0983	134	4294	135	7519	135	0662	136	3728	137	6721	136
30	0706	139	4015	139	7238	140	0380	141	3445	141	6440	140
31	300428	143	283736	144	266858	145	250098	146	233163	146	216156	145
32	0151	148	3458	149	6678	150	249817	150	2890	151	8573	150
33	299873	153	3179	154	6397	154	9535	155	2697	156	8289	155
34	9596	157	2900	158	6117	159	9253	160	2314	161	7904	160
35	9318	162	2621	163	5837	164	8972	165	2031	165	7619	164
36	9041	167	2342	168	5556	169	8690	169	1748	170	7334	169
37	8763	171	2062	172	5276	173	8408	174	1465	175	7049	174
38	8486	176	1783	177	4995	178	8126	179	1182	179	6764	178
39	8208	181	1504	182	4715	183	7845	183	0899	184	6479	183
40	7930	185	1225	186	4434	187	7563	188	0616	189	6194	188
41	297653	190	280946	191	264154	192	247281	193	230333	194	213311	193
42	7375	195	0667	196	3873	197	6999	198	0050	198	3790	197
43	7097	199	0388	200	3593	201	6717	202	229767	203	3506	202
44	6819	204	0108	205	3312	206	6435	207	9484	208	3221	207
45	6542	208	279829	210	3031	211	6153	212	9200	213	2936	212
46	6264	213	9550	214	2751	215	5871	216	8917	217	2651	216
47	5986	218	9270	219	2470	220	5589	221	8634	222	2366	221
48	5708	222	8991	224	2189	225	5307	225	8351	227	2081	226
49	5430	227	8712	228	1909	230	5025	230	8068	232	1796	231
50	5152	231	8432	233	1628	234	4743	235	7784	236	1511	235
51	294874	236	278153	238	261347	239	244461	240	227501	241	210477	240
52	4596	241	7874	242	1066	244	4179	245	7218	246	0155	245
53	4318	245	7594	247	0785	248	3897	249	6935	250	309020	249
54	4040	250	7315	252	0505	253	3615	254	6651	255	2805	254
55	3762	254	7035	256	0224	258	3333	259	6368	260	2520	258
56	3484	259	6756	261	259043	262	3051	263	6085	265	2235	264
57	3206	264	6476	266	9682	267	2769	268	5801	269	1950	268
58	2928	268	6197	270	9381	272	2486	273	5518	274	1665	273
59	2650	273	5917	275	9101	276	2204	277	5235	279	1380	278
60	2372	277	5637	279	8819	281	1922	282	4951	283	1095	282

	78°		79°		80°		81°		82°		83°	
	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
207912	0	190809	0	173648	0	156435	0	139173	0	121899	0	
7627	5	0523	5	3302	5	6147	5	8885	5	1581	5	
7343	9	0238	10	3075	10	5990	10	8597	10	1292	10	
7058	14	189652	14	2789	14	5578	14	8309	14	1008	14	
6773	19	9667	19	2502	19	5285	19	8021	19	9714	19	
6489	24	9851	24	2216	24	4996	24	7732	24	9426	24	
6204	28	9095	28	1929	28	4710	28	7445	28	9137	28	
5920	33	8810	33	1643	33	4423	33	7156	33	8848	33	
5635	38	8524	38	1356	38	4136	38	6866	38	8559	38	
5350	43	8239	43	1069	43	3848	43	6576	43	8270	43	
5066	47	7953	48	0783	48	3561	48	6282	48	7982	48	
204781	52	187667	52	170496	52	153273	53	136004	53	118789	53	
4496	57	7381	57	0210	57	2996	57	5716	58	5404	58	
4211	62	7096	62	169923	62	2698	62	5427	62	5115	62	
3927	66	6810	67	9636	67	2411	67	5139	67	4825	67	
3642	71	6524	71	9350	72	2123	72	4851	72	4537	72	
3357	76	6238	76	9063	76	1836	77	4563	77	4249	77	
3072	81	5952	81	8776	81	1548	81	4274	82	3960	82	
2787	85	5667	86	8489	86	1261	86	3986	86	3671	87	
2502	90	5381	91	8203	91	0973	91	3698	91	3382	91	
2218	95	5095	95	7916	96	0686	96	3410	96	3093	96	
201933	100	184809	100	167629	100	150398	101	133121	101	115904	101	
1648	104	4523	105	7342	105	0111	106	2833	106	5515	106	
1363	109	4237	110	7056	110	149823	111	2545	110	5226	111	
1078	114	3951	115	6769	115	9535	116	2256	115	4937	116	
0793	119	3665	119	6482	119	9248	120	1968	120	4648	120	
0508	123	3380	124	6195	124	8960	125	1680	125	4359	125	
0223	128	3094	129	5908	129	8672	130	1391	130	4070	130	
199938	133	2808	134	5621	134	8385	135	1103	134	3781	135	
9653	138	2522	138	5335	138	8097	140	0815	139	3492	140	
9368	143	2236	143	5048	143	7809	144	0526	144	3203	144	
199083	147	181950	148	164761	148	147522	149	130238	149	112914	149	
8798	152	1664	153	4474	153	7234	153	129949	154	2925	154	
8513	157	1377	157	4187	158	6946	158	9661	159	2636	159	
8228	162	1091	162	3900	163	6659	163	9373	163	2347	164	
7943	166	0905	167	3613	167	6371	168	9084	168	1758	168	
7657	171	0519	172	3326	172	6083	172	8796	173	1469	174	
7372	176	0233	176	3039	177	5795	177	8507	178	1180	179	
7087	181	179947	181	2752	182	5508	182	8219	183	0891	184	
6802	185	9661	186	2465	187	5220	187	7930	187	0602	188	
6517	190	9375	191	2178	191	4932	192	7642	192	0313	193	
198231	195	179088	195	161891	196	144644	196	127353	197	110023	198	
5946	200	8802	200	1604	201	4356	201	7065	202	109734	203	
5661	205	8516	205	1317	206	4068	206	6776	207	9445	208	
5376	209	8230	210	1030	210	3781	211	6486	212	9156	212	
5090	214	7944	214	0743	215	3493	215	6199	216	8867	217	
4805	219	7657	219	0456	220	3205	220	5910	221	8578	222	
4520	224	7371	224	0169	225	2917	225	5622	226	8289	227	
4234	228	7085	229	159851	230	2629	230	5333	231	7999	231	
3949	233	6798	234	9594	234	2341	235	5045	236	7710	236	
3664	238	6512	238	9307	239	2053	240	4756	240	7421	241	
198378	243	176226	243	159020	244	141765	244	124467	245	107132	246	
3093	247	5940	248	8733	249	1477	249	4179	250	0943	250	
2807	252	5653	253	8445	254	1189	254	3890	255	0653	255	
2522	257	5367	257	8158	258	0901	259	3602	260	0364	260	
2237	262	5080	262	7871	263	0613	264	3313	264	0075	265	
1951	267	4794	267	7584	268	0325	268	3024	269	5980	270	
1666	271	4508	272	7296	273	0037	273	2736	274	5690	275	
1380	276	4221	276	7009	277	139749	278	2447	279	5401	280	
1095	281	3935	281	6722	282	9461	283	2158	284	5112	285	
0809	285	3648	286	6435	287	9173	287	1869	288	4823	289	

100		NATURAL COSINES.												TABLE	
°	' "	84°		85°		86°		87°		88°		89°		90°	
		Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "	Co-sine.	Parts for "
0		104529	0	087156	0	069757	0	052336	0	034899	0	017452	0	0	0
1		4239	5	6866	5	9465	5	2046	5	4649	5	7162	5	9681	5
2		3950	10	6576	10	9176	10	1755	10	4318	10	6871	10	9381	10
3		3691	15	6283	15	8886	15	1465	15	4027	15	6580	15	9089	15
4		3371	19	5997	19	8596	19	1174	19	3737	19	6290	19	8798	19
5		3082	24	5707	24	8306	24	0884	24	3446	24	5998	24	8507	24
6		2792	29	5417	29	8015	29	0693	29	3155	29	5707	29	8216	29
7		2503	34	5127	34	7725	34	0302	34	2864	34	5417	34	7925	34
8		2214	39	4837	39	7435	39	0012	39	2574	39	5126	39	7635	39
9		1925	44	4547	44	7145	44	049721	44	2283	44	4835	44	7345	44
10		1635	48	4258	48	6854	48	9431	48	1992	48	4544	48	7054	48
11		101346	53	083068	53	065564	53	049140	53	031701	53	014253	53	0	53
12		1056	58	3678	58	6274	58	8850	58	1411	58	3902	58	6463	58
13		0767	63	3388	63	5984	63	8559	63	1120	63	3611	63	6172	63
14		0478	68	3098	68	5693	68	8269	68	0829	68	3321	68	5881	68
15		0188	73	2808	73	5403	73	7978	73	0539	73	3030	73	5590	73
16		099899	77	2518	77	5113	77	7688	77	0248	77	2739	77	5299	77
17		9609	82	2228	82	4823	82	7397	82	029957	82	2448	82	5008	82
18		9320	87	1939	87	4532	87	7107	87	9666	87	2157	87	4717	87
19		9030	92	1649	92	4242	92	6816	92	9376	92	1866	92	4426	92
20		8741	97	1359	97	3952	97	6525	97	9085	97	1575	97	4135	97
21		098461	102	081069	102	063661	102	046235	102	028794	102	011344	102	0	102
22		8162	107	0779	107	3371	106	5944	106	8503	106	1054	106	3746	106
23		7872	112	0489	112	3081	111	5654	111	8212	111	0763	111	3455	111
24		7583	116	0199	116	2791	116	5363	116	7922	116	0472	116	3164	116
25		7293	121	079909	121	2500	121	5072	121	7631	121	0181	121	2873	121
26		7004	126	9619	126	2210	126	4782	126	7340	126	0690	126	2582	126
27		6714	131	9329	131	1920	131	4491	131	7049	131	0399	131	2291	131
28		6425	136	9039	136	1629	136	4201	136	6759	136	0108	136	2000	136
29		6135	141	8749	141	1339	140	3910	140	6468	140	0817	140	1709	140
30		5846	145	8459	145	1049	145	3619	145	6177	145	0526	145	1418	145
31		095556	150	078169	150	060758	150	043329	150	025886	150	008436	150	0	150
32		5267	155	7879	155	0469	155	3088	155	5595	155	8145	155	3755	155
33		4977	160	7589	160	0178	160	2748	160	5305	160	7854	160	3464	160
34		4688	164	7299	164	059887	165	2457	165	5014	165	7563	165	3173	165
35		4398	169	7009	169	9597	169	2166	169	4723	170	7272	170	2882	170
36		4108	174	6719	174	9306	174	1876	174	4432	175	6981	175	2591	175
37		3819	179	6429	179	9016	179	1585	179	4141	179	6690	179	2300	179
38		3529	184	6139	184	8726	184	1294	184	3851	184	6400	184	2009	184
39		3240	189	5849	189	8435	189	1004	189	3560	189	6109	189	1718	189
40		2950	193	5559	193	8145	194	0713	194	3269	194	5818	194	1427	194
41		092660	198	075269	198	057884	198	040422	198	022978	199	005527	199	0	199
42		2371	203	4979	203	7564	203	0132	203	2687	204	5236	204	3764	204
43		2081	208	4689	208	7274	208	039841	208	2397	209	4945	209	3473	209
44		1791	213	4399	213	6983	213	3551	213	2106	213	4654	213	3182	213
45		1502	218	4109	218	6693	218	9260	218	1815	218	4363	218	2891	218
46		1212	222	3818	222	6402	223	8969	223	1524	223	4072	223	2600	223
47		0922	227	3528	227	6112	227	8679	227	1233	228	3781	228	2309	228
48		0633	232	3238	232	5822	232	8388	232	0942	233	3491	233	2018	233
49		0343	237	2948	237	5531	237	8097	237	0652	238	3200	238	1727	238
50		0053	242	2658	242	5241	242	7807	242	0361	243	2909	243	1436	243
51		089764	247	072368	247	054950	247	037516	247	020070	247	002625	247	0	247
52		9174	252	2078	252	4660	252	7225	252	019779	252	5337	252	3773	252
53		9184	257	1788	257	4369	257	6934	257	9488	257	5046	257	3482	257
54		8894	261	1497	261	4079	261	6644	261	9197	262	4745	262	3191	262
55		8605	266	1207	266	3788	266	6353	266	8907	267	4454	267	2900	267
56		8315	271	0917	271	3498	271	6062	271	8616	272	4163	272	2609	272
57		8025	276	0627	276	3207	276	5772	276	8325	276	3872	276	2318	276
58		7735	281	0337	281	2917	281	5481	281	8034	281	3581	281	2027	281
59		7446	285	0047	285	2626	285	5190	285	7743	285	3290	285	1736	285
60		7156	290	069757	290	2335	290	4899	290	7452	290	3000	290	1445	290

TABLE 7.

TABLE 7.] PROPORTIONAL LOGARITHMS.													101
S.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
#	0° 0'	0° 1'	0° 2'	0° 3'	0° 4'	0° 5'	0° 6'	0° 7'	0° 8'	0° 9'	0° 10'		
0		2-2553	1-9542	1-7782	1-6532	1-5563	1-4771	1-4102	1-3522	1-3010	1-2553		
1	40334	481	506	527	544	559	575	591	607	622	636	650	664
2	37324	410	471	534	496	534	574	611	646	679	710	739	766
3	5563	341	435	510	478	520	565	607	646	682	715	746	775
4	4314	272	400	486	460	506	553	597	638	675	708	739	768
5	3345	205	365	453	443	491	539	584	625	662	695	726	755
6	2553	139	331	429	425	477	525	569	609	645	678	709	738
7	1883	073	296	406	407	463	511	555	594	629	662	693	722
8	1303	009	262	383	390	449	497	540	578	612	645	676	705
9	0792	2-1946	228	350	372	435	483	525	562	595	627	658	688
10	30334	2-1883	1-9195	1-7547	1-6355	1-5421	1-4652	1-4000	1-3432	1-2931	1-2481		
11	29920	822	162	524	338	407	640	1-3889	423	923	474		
12	9542	761	128	501	320	393	629	979	415	915	467		
13	9195	701	096	479	303	379	617	969	406	907	460		
14	8873	642	063	456	286	365	606	959	397	899	453		
15	8573	584	081	434	269	351	594	949	388	891	445		
16	8293	526	1-8999	412	252	337	582	939	379	883	438		
17	8030	469	967	390	235	324	571	929	371	876	431		
18	7782	413	935	368	218	310	559	919	362	868	424		
19	7547	358	904	346	201	296	548	910	353	860	417		
20	27324	2-1303	1-8873	1-7324	1-6185	1-5263	1-4536	1-3900	1-3345	1-2852	1-2410		
21	7112	249	842	302	168	269	525	890	336	845	403		
22	6910	196	811	281	151	256	514	880	327	837	396		
23	6717	143	781	259	135	242	502	870	319	829	389		
24	6532	091	751	238	118	229	491	860	310	821	382		
25	6355	040	721	217	102	215	480	851	301	814	375		
26	6185	2-0989	691	196	085	202	469	841	293	806	368		
27	6021	939	661	175	069	189	457	831	284	798	361		
28	5863	889	632	154	053	175	446	821	276	791	355		
29	5710	840	602	133	037	162	435	812	267	783	348		
30	2-5563	2-0792	1-8573	1-7112	1-6021	1-5149	1-4424	1-3802	1-3259	1-2775	1-2341		
31	5421	744	544	081	006	136	412	792	250	768	334		
32	5253	696	516	071	1-5989	123	401	783	242	760	327		
33	5149	649	487	050	973	110	390	773	233	753	320		
34	5019	603	459	030	957	097	379	764	225	745	313		
35	4894	557	431	010	941	084	368	754	216	738	307		
36	4771	512	403	1-6990	925	071	357	745	208	730	300		
37	4652	467	375	970	909	058	346	735	199	722	2-2293		
38	4536	422	348	950	894	045	335	726	191	715	226		
39	4424	378	320	930	878	032	325	716	183	707	279		
40	2-4314	2-0834	1-8293	1-6910	1-5863	1-5019	1-4314	1-3707	1-3174	1-2700	1-2272		
41	4206	291	266	890	847	007	308	897	166	1-2692	266		
42	4102	248	239	871	832	1-4994	292	888	158	685	259		
43	4000	206	212	851	816	981	281	878	149	678	252		
44	3900	164	186	832	801	969	270	869	141	670	245		
45	3802	122	159	812	786	956	260	860	133	663	239		
46	3707	081	133	793	771	943	249	850	124	655	232		
47	3613	040	107	774	755	931	238	841	116	648	225		
48	3522	000	081	755	740	918	228	832	108	640	218		
49	3432	1-9960	055	736	725	906	217	823	100	633	212		
50	2-3345	1-9920	1-8030	1-6717	1-5710	1-4894	1-4206	1-3613	1-3091	1-2626	1-2205		
51	3259	881	004	698	695	881	196	604	083	618	1-2198		
52	3174	842	1-7979	679	680	869	185	595	075	611	192		
53	3091	803	954	661	666	856	175	586	067	604	185		
54	3010	765	929	642	651	844	164	576	059	1-2596	178		
55	2931	727	904	624	636	832	154	567	051	589	172		
56	2852	690	879	605	621	820	143	558	043	582	165		
57	2775	652	855	587	607	808	133	549	034	574	158		
58	2700	615	830	568	592	795	122	540	026	567	152		
59	2626	579	806	550	578	783	112	531	018	560	145		

s.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
0	0° 11'	0° 12'	0° 13'	0° 14'	0° 15'	0° 16'	0° 17'	0° 18'	0° 19'	0° 20'	0° 21'	0° 22'
0	1-2139	1-1781	1-1413	1-1091	1-0792	1-0512	1-0248	1-0000	9765	9542	9331	9131
1	32	55	08	86	87	07	44	0-9996	61	39	27	17
2	26	49	02	81	82	02	40	92	58	35	24	14
3	19	43	1-1397	76	77	1-0498	35	88	54	32	20	10
4	13	37	91	71	73	93	31	84	50	28	17	7
5	06	31	86	66	68	89	27	80	46	24	13	3
6	1-2099	25	80	61	63	84	23	76	42	21	10	0
7	98	19	74	55	58	80	19	72	39	17	06	0
8	86	13	69	50	53	75	14	68	35	14	03	0
9	80	07	63	45	49	71	10	64	31	10	00	0
10	1-2073	1-1701	1-1358	1-1040	1-0744	1-0467	1-0206	9960	9727	9506	9296	9096
11	67	1-1695	52	35	39	62	02	56	23	03	08	08
12	61	59	47	30	34	58	1-0197	52	20	9499	9299	9100
13	54	53	42	25	30	53	93	48	16	96	88	80
14	48	77	36	20	25	49	89	44	12	92	84	76
15	41	71	31	15	20	44	85	40	08	88	79	71
16	35	65	25	09	15	40	81	36	05	86	77	69
17	28	60	20	04	11	35	76	32	01	81	72	64
18	22	54	14	1-0999	06	31	72	28	9697	9497	9298	9100
19	16	48	09	94	01	26	68	24	83	74	66	58
20	1-2069	1-1642	1-1303	1-0989	1-0696	1-0422	1-0164	9920	9680	9471	9271	9071
21	03	36	1-1298	84	82	18	60	16	58	57	49	41
22	96	30	92	79	87	13	56	12	52	64	56	48
23	90	24	87	74	82	09	51	08	78	60	52	44
24	84	19	82	69	78	04	47	05	75	56	48	40
25	77	13	76	64	73	00	43	01	71	53	45	37
26	71	07	71	59	68	1-0395	39	9897	67	49	41	33
27	65	01	66	54	63	91	35	93	64	46	38	30
28	58	1-1595	60	49	59	87	31	89	60	42	34	26
29	52	89	55	44	54	82	26	85	56	39	31	23
30	1-1946	1-1584	1-1249	1-0939	1-0649	1-0378	1-0122	9881	9632	9433	9233	9033
31	39	78	44	34	45	74	18	77	49	39	31	23
32	33	72	39	29	40	69	14	73	45	35	27	19
33	27	66	33	24	35	65	10	69	41	31	23	15
34	21	61	28	19	31	60	06	65	38	28	20	12
35	14	55	23	14	26	56	02	61	34	25	17	9
36	08	49	17	09	21	52	1-0098	58	30	22	14	6
37	02	43	12	04	17	47	93	54	26	11	03	0
38	1-1896	38	07	1-0899	12	43	89	50	23	07	04	0
39	89	32	01	94	08	39	85	46	19	04	0	0
40	1-1883	1-1526	1-1196	1-0889	1-0603	1-0334	1-0081	9842	9615	9400	9199	9000
41	77	20	91	84	1-0598	30	77	38	12	9387	9188	9000
42	71	15	86	80	94	26	73	84	06	90	82	74
43	65	09	80	75	89	21	69	80	04	88	80	72
44	58	03	75	70	85	17	65	27	01	86	78	70
45	52	1-1498	70	65	80	13	61	23	9597	88	80	72
46	46	92	64	60	75	08	57	19	98	76	68	60
47	40	86	59	55	71	04	53	15	90	72	64	56
48	34	81	54	50	66	00	49	11	86	68	60	52
49	28	75	49	45	62	1-0295	44	07	82	64	56	48
50	1-1822	1-1469	1-1143	1-0840	1-0557	1-0291	1-0040	9803	9579	9365	9165	9000
51	16	64	38	35	52	87	36	00	75	65	57	49
52	09	58	33	31	48	82	32	9796	71	62	54	46
53	03	52	28	26	43	78	28	92	68	59	51	43
54	1-1797	47	23	21	39	74	24	88	64	55	47	39
55	91	41	17	16	34	70	20	84	61	52	44	36
56	85	36	12	11	30	65	16	80	57	49	41	33
57	79	30	07	06	25	61	12	77	53	45	37	29
58	73	24	02	01	21	57	08	73	50	42	34	26
59	67	19	1-1097	1-0797	16	52	04	69	46	38	30	22

h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
0° 22'	0° 23'	0° 24'	0° 25'	0° 26'	0° 27'	0° 28'	0° 29'	0° 30'	0° 31'	0° 32'	
9128	8935	8751	8573	8408	8259	8081	7929	7782	7639	7501	
25	32	45	70	00	36	79	26	79	37	7499	
22	29	45	68	8897	84	76	24	77	34	97	
19	26	43	65	95	81	73	21	74	32	94	
15	23	39	62	92	28	71	19	72	30	92	
12	20	36	59	89	26	68	16	69	27	90	
09	17	33	56	86	23	66	14	67	25	88	
06	13	30	53	84	20	63	11	65	22	86	
03	10	27	50	81	18	61	09	63	20	83	
9099	07	24	47	78	15	58	06	60	18	81	
9096	8904	8731	8544	8375	8212	8055	7904	7757	7616	7479	
92	01	18	43	72	10	53	01	55	13	76	
89	8898	15	39	70	07	50	7899	53	11	74	
86	95	12	36	67	04	48	96	50	09	72	
83	92	09	33	64	02	45	94	48	07	70	
79	88	06	30	61	8199	43	91	45	04	67	
76	85	03	27	59	96	40	89	43	02	65	
73	82	00	24	56	94	37	87	41	00	63	
70	79	8997	22	53	91	35	84	38	7597	61	
66	76	94	19	50	88	32	82	36	95	58	
9068	8973	8891	8816	8348	8186	8080	7879	7784	7598	7456	
60	70	86	13	45	88	27	77	31	90	54	
57	67	85	10	42	81	25	74	29	88	52	
53	64	82	07	39	78	22	72	26	86	50	
50	61	79	04	37	75	20	69	24	83	47	
47	57	76	02	34	73	17	67	22	81	45	
44	54	73	8499	31	70	14	64	19	79	43	
41	51	70	96	28	67	12	62	17	77	41	
37	48	67	93	26	65	09	60	14	74	38	
34	45	64	90	23	62	07	57	13	72	36	
9081	8943	8861	8497	8330	8159	8004	7855	7710	7570	7434	
28	39	58	84	18	57	02	52	07	67	82	
24	36	55	82	15	54	7999	50	05	65	29	
21	33	52	79	12	52	97	47	03	63	27	
18	30	49	76	09	49	94	45	00	60	25	
15	27	46	73	07	46	92	43	7998	58	23	
12	24	43	70	04	44	89	40	96	56	21	
08	21	40	67	01	41	87	37	93	54	18	
06	17	37	65	8298	38	84	35	91	51	16	
02	14	35	62	96	36	81	32	88	49	14	
8999	8911	8832	8459	8293	8133	7979	7830	7686	7547	7412	
96	08	29	56	90	31	76	28	84	44	09	
92	05	26	53	88	28	74	25	81	42	07	
89	02	23	51	85	25	71	23	79	40	05	
86	8799	20	48	82	23	69	20	77	38	03	
83	96	17	45	79	20	66	18	74	35	01	
80	93	14	42	77	17	64	15	72	33	7998	
77	90	12	39	74	15	61	13	70	31	96	
73	87	08	37	71	12	59	11	67	28	94	
70	84	05	34	69	10	56	08	65	26	92	
8987	8781	8602	8431	8268	8107	7954	7806	7668	7534	7390	
64	78	8599	28	63	04	51	03	60	23	87	
61	75	97	25	61	02	49	01	58	19	85	
58	72	94	23	58	8099	46	7798	55	17	83	
54	69	91	20	55	97	44	96	53	15	81	
51	66	88	17	53	94	41	94	51	13	79	
48	63	85	14	50	91	39	91	48	10	76	
45	60	82	11	47	89	36	89	46	08	74	
42	57	79	09	44	86	34	86	44	06	72	
39	54	76	06	42	84	31	84	41	04	70	

s. "	h. m. 0° 33'	h. m. 0° 34'	h. m. 0° 35'	h. m. 0° 36'	h. m. 0° 37'	h. m. 0° 38'	h. m. 0° 39'	h. m. 0° 40'	h. m. 0° 41'	h. m. 0° 42'	h. m. 0° 43'
0	7368	7238	7112	6990	6871	6755	6642	6532	6425	6320	6218
1	65	36	10	88	69	53	40	30	23	19	16
2	63	34	08	86	67	51	38	29	21	17	15
3	61	32	06	84	65	49	37	27	20	15	13
4	59	29	04	82	63	47	35	25	18	13	11
5	57	27	02	80	61	45	33	23	16	12	10
6	54	25	00	78	59	43	31	21	14	10	08
7	52	23	7098	76	57	42	29	19	13	08	06
8	50	21	96	74	55	40	27	18	11	06	05
9	48	19	93	72	53	38	25	16	09	05	03
10	7346	7217	7091	6970	6851	6736	6624	6514	6407	6303	6201
11	44	15	89	68	49	34	22	12	06	01	00
12	41	12	87	66	47	32	20	10	04	00	00
13	39	10	85	64	45	30	18	09	02	6288	6186
14	37	08	83	62	43	28	16	07	00	96	86
15	35	06	81	60	41	26	14	05	6398	94	83
16	33	04	79	58	40	25	12	03	97	93	81
17	30	02	77	56	38	23	11	01	95	91	80
18	28	00	75	54	36	21	09	00	93	89	78
19	26	7198	73	52	34	19	07	6498	91	88	76
20	7324	7196	7071	6950	6832	6717	6605	6496	6390	6286	6185
21	22	93	69	48	30	15	03	94	88	84	73
22	20	91	67	46	28	13	01	92	86	82	71
23	17	89	65	44	26	11	00	91	84	81	70
24	15	87	63	42	24	09	6598	89	83	79	68
25	13	85	61	40	22	08	96	87	81	77	66
26	11	83	59	38	20	06	94	85	79	76	64
27	09	81	57	36	18	04	92	84	77	74	63
28	07	79	55	34	16	02	90	82	76	72	61
29	04	77	52	32	14	00	89	80	74	71	60
30	7302	7175	7050	6930	6812	6698	6587	6478	6372	6269	6168
31	00	72	48	28	10	96	85	78	71	67	56
32	7298	70	46	26	09	94	83	75	69	65	54
33	96	68	44	24	07	92	81	73	67	64	53
34	94	66	42	22	05	91	79	71	65	62	51
35	91	64	40	20	03	89	78	69	64	60	50
36	89	62	38	18	01	87	76	67	62	59	48
37	87	60	36	16	6799	85	74	66	60	57	46
38	85	58	34	14	97	83	72	64	58	55	45
39	83	56	32	12	95	81	70	62	57	54	43
40	7281	7154	7030	6910	6793	6679	6568	6460	6355	6252	6151
41	79	52	28	08	91	77	67	59	53	50	40
42	76	49	26	06	89	76	65	57	51	48	38
43	74	47	24	04	87	74	63	55	50	47	37
44	72	45	22	02	85	72	61	53	48	45	35
45	70	43	20	00	84	70	59	51	46	43	34
46	68	41	18	6898	82	68	58	50	44	42	32
47	66	39	16	96	80	66	56	48	43	40	30
48	64	37	14	94	78	64	54	46	41	38	29
49	61	35	12	92	76	63	52	44	39	37	28
50	7259	7133	7010	6890	6774	6661	6550	6443	6338	6235	6134
51	57	31	08	88	73	59	48	41	36	33	23
52	55	29	06	86	70	57	47	39	34	32	21
53	53	27	04	84	68	55	45	37	32	30	20
54	51	24	02	82	66	53	43	35	31	28	19
55	49	22	00	81	64	51	41	34	29	26	18
56	46	20	6998	79	63	50	39	32	27	25	16
57	44	18	96	77	61	48	38	30	25	23	15
58	42	16	94	75	59	46	36	28	23	21	14
59	40	14	92	73	57	44	34	27	22	20	13

TABLE 7.]

PROPORTIONAL LOGARITHMS.

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s. #	h. m. 0° 44'	h. m. 0° 45'	h. m. 0° 46'	h. m. 0° 47'	h. m. 0° 48'	h. m. 0° 49'	h. m. 0° 50'	h. m. 0° 51'	h. m. 0° 52'	h. m. 0° 53'	h. m. 0° 54'
0	6118	6021	5925	5832	5740	5651	5563	5477	5393	5310	5229
1	17	19	24	30	39	49	62	76	91	109	27
2	15	17	22	29	37	48	60	74	90	107	26
3	13	16	20	27	36	46	59	73	89	106	25
4	12	14	19	26	34	45	57	71	87	105	23
5	10	13	17	24	33	43	56	70	86	103	22
6	08	11	16	23	31	42	54	69	84	102	21
7	07	09	14	21	30	40	53	67	83	100	19
8	05	08	13	19	28	39	51	66	82	99	18
9	03	06	11	18	27	37	50	64	80	98	17
10	6102	6005	5909	5816	5725	5636	5549	5463	5379	5296	5215
11	00	03	08	15	24	35	47	61	77	95	14
12	6099	01	06	13	22	33	46	60	76	94	13
13	97	00	05	12	21	32	44	59	75	92	11
14	95	5998	03	10	19	30	43	57	73	91	10
15	94	97	02	09	18	29	41	56	72	90	09
16	92	95	00	07	16	27	40	54	70	88	07
17	90	93	5999	06	15	26	38	53	69	87	06
18	89	92	97	04	13	24	37	52	68	86	05
19	87	90	95	03	12	23	36	50	66	84	03
20	6085	5989	5894	5801	5710	5621	5534	5449	5365	5283	5202
21	84	87	92	00	09	20	33	47	64	81	01
22	82	85	91	5798	07	18	31	46	62	80	5199
23	81	84	89	96	06	17	30	45	61	79	98
24	79	82	88	95	04	15	28	43	59	77	97
25	77	81	86	93	03	14	27	42	58	76	95
26	76	79	84	92	01	13	26	40	57	75	94
27	74	77	83	90	00	11	24	39	55	73	93
28	72	76	81	89	5698	10	22	37	54	72	91
29	71	74	80	87	97	08	21	36	53	71	90
30	6069	5973	5878	5786	5695	5607	5520	5435	5351	5269	5189
31	67	71	77	84	94	05	18	33	50	68	87
32	66	69	75	83	92	04	17	32	48	66	86
33	64	68	74	81	91	02	16	30	47	65	85
34	63	66	72	80	89	01	14	29	46	64	83
35	61	65	70	78	88	5599	13	28	44	62	82
36	59	63	69	77	86	98	11	26	43	61	81
37	58	61	67	75	85	96	10	25	41	60	79
38	56	60	66	74	83	95	08	23	40	58	78
39	55	58	64	72	82	94	07	22	39	57	77
40	6053	5957	5863	5771	5680	5592	5506	5421	5337	5256	5175
41	51	55	61	69	79	91	04	19	36	54	74
42	50	54	60	68	77	89	03	18	35	53	73
43	48	52	58	66	76	88	01	16	33	52	72
44	46	50	56	65	74	86	00	15	32	50	70
45	45	49	55	63	73	85	5498	14	31	49	69
46	43	47	53	61	71	83	97	12	29	48	68
47	42	46	52	60	70	82	96	11	28	46	66
48	40	44	50	58	69	80	94	09	26	45	65
49	38	42	49	57	67	79	93	08	25	44	64
50	6037	5941	5847	5755	5666	5578	5491	5407	5324	5242	5162
51	35	39	46	54	64	76	90	05	22	41	61
52	33	38	44	52	63	75	88	04	21	40	60
53	32	36	43	51	61	73	87	02	20	39	59
54	30	35	41	49	60	72	86	01	18	37	57
55	29	33	39	47	58	70	84	00	17	36	56
56	27	31	38	46	57	69	83	5398	15	34	55
57	25	30	36	45	55	67	81	97	14	33	54
58	24	29	35	43	54	66	80	95	13	31	53
59	22	27	33	42	52	64	78	94	11	30	52

h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
0° 55'	0° 56'	0° 57'	0° 58'	0° 59'	1° 0'	1° 1'	1° 2'	1° 3'	1° 4'	1° 5'	2° 0'	2° 1'	2° 2'	2° 3'	2° 4'	2° 5'	3° 0'	3° 1'
0	5149	5071	4994	4918	4844	4771	4699	4629	4559	4491	4424	4358	4293	4229	4165	4102	4039	3976
1	48	70	93	17	43	70	98	128	158	189	220	251	282	313	344	375	406	437
2	45	68	91	16	42	69	97	126	156	187	218	249	280	311	342	373	404	435
3	45	67	90	15	41	68	96	125	155	186	217	248	279	310	341	372	403	434
4	44	66	89	13	39	66	95	124	154	185	216	247	278	309	340	371	402	433
5	43	64	88	12	38	65	93	123	153	184	215	246	277	308	339	370	401	432
6	41	63	86	11	37	64	92	122	152	183	214	245	276	307	338	369	400	431
7	40	62	85	10	36	63	91	121	151	182	213	244	275	306	337	368	399	430
8	39	61	84	08	34	62	90	119	150	181	212	243	274	305	336	367	398	429
9	37	59	83	07	33	60	89	118	149	180	211	242	273	304	335	366	397	428
10	5136	5058	4981	4906	4832	4759	4688	4617	4548	4480	4412	4345	4278	4212	4146	4080	4014	3948
11	35	57	80	05	31	58	86	116	147	178	209	240	271	302	333	364	395	426
12	33	55	79	03	30	57	85	115	146	177	208	239	270	301	332	363	394	425
13	32	54	77	02	28	56	84	114	145	176	207	238	269	300	331	362	393	424
14	31	53	76	01	27	54	83	113	144	175	206	237	268	299	330	361	392	423
15	29	51	75	00	26	53	82	112	143	174	205	236	267	298	329	360	391	422
16	28	50	74	4899	25	52	80	110	141	173	204	235	266	297	328	359	390	421
17	27	49	72	97	23	51	79	109	140	172	203	234	265	296	327	358	389	420
18	25	48	71	96	22	50	78	108	139	171	202	233	264	295	326	357	388	419
19	24	46	70	95	21	48	77	107	138	170	201	232	263	294	325	356	387	418
20	5123	5045	4969	4894	4820	4747	4676	4606	4536	4468	4400	4333	4266	4199	4132	4065	3998	3931
21	22	44	67	92	19	46	75	104	135	166	197	228	259	290	321	352	383	414
22	20	43	66	91	17	45	73	103	134	165	196	227	258	289	320	351	382	413
23	19	41	65	90	16	44	72	102	133	164	195	226	257	288	319	350	381	412
24	18	40	64	89	15	42	71	101	132	163	194	225	256	287	318	349	380	411
25	16	39	62	87	14	41	70	100	131	162	193	224	255	286	317	348	379	410
26	15	37	61	86	12	40	69	4599	130	161	192	223	254	285	316	347	378	409
27	14	36	60	85	11	39	68	97	129	160	191	222	253	284	315	346	377	408
28	12	35	59	84	10	38	66	96	128	159	190	221	252	283	314	345	376	407
29	11	34	57	82	09	36	65	95	127	158	189	220	251	282	313	344	375	406
30	5110	5032	4956	4881	4806	4735	4664	4594	4525	4457	4389	4321	4253	4185	4117	4049	3981	3913
31	08	31	55	80	06	34	63	93	126	157	188	219	250	281	312	343	374	405
32	07	30	54	79	05	33	62	92	125	156	187	218	249	280	311	342	373	404
33	06	28	52	77	04	32	60	90	124	155	186	217	248	279	310	341	372	403
34	05	27	51	76	03	30	59	89	123	154	185	216	247	278	309	340	371	402
35	03	26	50	75	01	29	58	88	122	153	184	215	246	277	308	339	370	401
36	02	25	49	74	00	28	57	87	121	152	183	214	245	276	307	338	369	400
37	01	23	47	73	4799	27	56	86	120	151	182	213	244	275	306	337	368	399
38	5099	22	46	71	98	26	55	85	119	150	181	212	243	274	305	336	367	398
39	98	21	45	70	97	24	53	84	118	149	180	211	242	273	304	335	366	397
40	5097	5019	4943	4869	4795	4723	4652	4582	4514	4446	4379	4311	4243	4175	4107	4039	3971	3903
41	95	18	42	68	94	22	51	81	12	45	76	107	138	169	200	231	262	293
42	94	17	41	66	93	21	50	80	11	44	75	106	137	168	199	230	261	292
43	93	16	40	65	92	20	49	79	10	43	74	105	136	167	198	229	260	291
44	92	14	38	64	91	18	48	78	09	41	73	104	135	166	197	228	259	290
45	90	13	37	63	89	17	46	77	08	40	72	103	134	165	196	227	258	289
46	89	12	36	61	88	16	45	75	07	39	71	102	133	164	195	226	257	288
47	88	11	35	60	87	15	44	74	06	38	70	101	132	163	194	225	256	287
48	86	09	33	59	86	14	43	73	05	37	69	100	131	162	193	224	255	286
49	85	08	32	58	85	12	42	72	03	36	68	99	130	161	192	223	254	285
50	5094	5007	4931	4856	4783	4711	4640	4571	4502	4435	4368	4300	4233	4165	4098	4030	3963	3895
51	82	06	30	55	82	10	39	69	01	34	66	97	128	159	190	221	252	283
52	81	04	28	54	81	09	38	68	00	33	65	96	127	158	189	220	251	282
53	80	03	27	53	80	08	37	67	4499	31	64	95	126	157	188	219	250	281
54	79	02	26	52	78	07	36	66	98	30	63	94	125	156	187	218	249	280
55	77	00	25	50	77	06	35	65	97	29	62	93	124	155	186	217	248	279
56	76	4999	23	49	76	04	33	64	95	28	61	92	123	154	185	216	247	278
57	75	98	22	48	75	03	32	63	94	27	60	91	122	153	184	215	246	277
58	73	97	21	47	74	02	31	62	93	26	59	90	121	152	183	214	245	276
59	72	95	20	45	72	01	30	61	92	25	58	89	120	151	182	213	244	275

TABLE 7.]

PROPORTIONAL LOGARITHMS.

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S. N	h. m. 1° 6'	h. m. 1° 7'	h. m. 1° 8'	h. m. 1° 9'	h. m. 1° 10'	h. m. 1° 11'	h. m. 1° 12'	h. m. 1° 13'	h. m. 1° 14'	h. m. 1° 15'	h. m. 1° 16'
0	4357	4292	4228	4164	4102	4040	3979	3919	3860	3802	3745
1	56	91	27	63	01	39	78	19	59	01	44
2	55	80	26	62	00	38	77	18	58	00	43
3	54	69	24	61	4069	37	76	17	57	3799	42
4	53	58	23	60	98	36	75	16	56	98	41
5	52	47	22	59	97	35	74	15	55	97	40
6	51	35	21	58	96	34	73	14	55	96	39
7	50	24	20	57	95	33	72	13	54	95	38
8	49	13	19	56	93	32	71	12	53	94	37
9	48	02	18	55	92	31	70	11	52	93	36
10	4346	4281	4217	4154	4091	4030	3969	3910	3851	3792	3735
11	45	80	16	53	90	29	68	09	50	92	34
12	44	79	15	52	89	28	67	08	49	91	33
13	43	78	14	51	88	27	66	07	48	90	32
14	42	77	13	50	87	26	65	06	47	89	31
15	41	76	12	49	86	25	64	05	46	88	30
16	40	75	11	47	85	24	63	04	45	87	29
17	39	74	10	46	84	23	62	03	44	86	28
18	38	73	09	45	83	22	61	02	43	85	27
19	36	71	07	44	82	21	60	01	42	84	27
20	4335	4270	4206	4143	4081	4020	3959	3900	3841	3783	3726
21	34	69	06	42	80	19	58	3899	40	82	25
22	33	68	04	41	79	18	57	98	39	81	24
23	32	67	03	40	78	17	56	97	38	80	23
24	31	66	02	39	77	16	55	96	37	79	22
25	30	65	01	38	76	15	54	95	36	78	21
26	29	64	00	37	75	14	53	94	35	77	20
27	28	63	4199	36	74	13	52	93	34	76	19
28	27	62	98	35	73	12	51	92	33	75	18
29	26	61	97	34	72	11	50	91	32	74	17
30	4325	4260	4196	4133	4071	4010	3949	3890	3831	3773	3716
31	23	59	95	32	70	09	48	89	30	72	15
32	22	58	94	31	69	08	47	88	29	71	14
33	21	56	93	30	68	07	46	87	28	70	13
34	20	55	92	29	67	06	45	86	27	69	12
35	19	54	91	28	66	05	44	85	26	68	11
36	18	53	89	27	65	04	43	84	25	67	10
37	17	52	88	26	64	03	42	83	24	67	09
38	16	51	87	25	63	02	41	82	23	66	08
39	15	50	86	24	62	01	40	81	22	65	08
40	4314	4249	4185	4122	4061	4000	3939	3880	3821	3764	3707
41	13	48	84	21	60	3999	38	79	20	63	06
42	11	47	83	20	59	98	37	78	20	62	05
43	10	46	82	19	58	97	36	77	19	61	04
44	09	45	81	18	56	96	35	76	18	60	03
45	08	44	80	17	55	95	34	75	17	59	02
46	07	43	79	16	54	93	33	74	16	58	01
47	06	41	78	15	53	92	32	73	15	57	00
48	05	40	77	14	52	91	31	72	14	56	3699
49	04	39	76	13	51	90	30	71	13	55	98
50	4303	4238	4175	4112	4050	3989	3929	3870	3812	3754	3697
51	02	37	74	11	49	88	29	69	11	63	96
52	01	36	73	10	48	87	27	68	10	62	95
53	00	35	72	09	47	86	26	67	09	61	94
54	4293	34	71	08	46	85	25	66	08	60	93
55	97	33	69	07	45	84	24	65	07	49	93
56	96	32	68	06	44	83	23	64	06	48	92
57	95	31	67	05	43	82	22	63	05	47	91
58	94	30	66	04	42	81	21	62	04	46	90
59	93	29	65	03	41	80	20	61	03	45	89

s.	h. m. 1° 17'	h. m. 1° 18'	h. m. 1° 19'	h. m. 1° 20'	h. m. 1° 21'	h. m. 1° 22'	h. m. 1° 23'	h. m. 1° 24'	h. m. 1° 25'	h. m. 1° 26'
0	3688	3632	3576	3522	3468	3415	3362	3310	3259	3208
1	87	31	76	21	67	14	61	09	58	07
2	86	30	75	20	66	13	60	08	57	06
3	85	29	74	19	65	12	59	07	56	05
4	84	28	73	18	64	11	58	06	55	04
5	83	27	72	17	63	10	57	05	53	03
6	82	26	71	16	62	09	56	04	52	02
7	81	25	70	15	61	08	55	03	51	01
8	80	24	69	14	60	07	54	02	50	00
9	79	23	68	13	59					
10	3678	3623	3567	3513	3459	3405	3353	3301	3250	3198
11	77	22	66	12	58	05	52	00	49	48
12	76	21	65	11	57	04	51	00	48	47
13	75	20	64	10	56	03	50	98	47	46
14	74	19	63	09	55	02	49	97	46	45
15	73	18	62	08	54	01	48	96	45	44
16	72	17	61	07	53	00	47	95	44	43
17	71	16	60	06	52	3399	46	94	43	42
18	70	15	59	05	51	98	45	94	42	
19		14								
20	3669	3613	3558	3504	3450	3397	3345	3293	3242	3190
21	68	12	57	03	49	96	44	92	41	40
22	67	11	56	02	48	95	43	91	40	39
23	66	10	55	01	47	94	42	90	39	38
24	65	09	54	00	46	93	41	89	38	37
25	64	08	53	98	45	92	40	88	37	36
26	63	07	52	97	44	91	39	87	36	35
27	62	06	51	96	43	90	38	86	35	34
28	61	05	50		42	89	37	85	34	
29										
30	3660	3604	3549	3495	3441	3388	3336	3284	3233	3181
31	59	03	48	94	40	87	35	83	32	31
32	58	02	47	93	39	86	34	82	31	30
33	57	01	46	92	38	85	33	81	30	29
34	56	00	45	91	37	84	32	80	29	28
35	55	3599	45	90	36	83	31	79	28	27
36	54	98	44	89	35	82	30	78	27	26
37	53	98	43	88	34	81	29	77	26	25
38	52	97	42	87	33	80	28	76	25	
39	51	96	41							
40	3650	3595	3540	3486	3432	3379	3327	3276	3225	3173
41	49	94	39	85	31	79	26	75	24	23
42	48	93	38	84	30	78	25	74	23	22
43	47	92	37	83	29	77	24	73	22	21
44	46	91	36	82	28	76	23	72	21	20
45	45	90	35	81	27	75	22	71	20	19
46	44	89	34	80	26	74	21	70	19	18
47	43	88	33	79	25	73	20	69	18	17
48	42	87	32	78	24	72	19	68	17	16
49		86								
50	3641	3586	3531	3477	3423	3371	3319	3267	3216	3165
51	40	85	30	76	23	70	18	65	15	14
52	39	84	29	75	22	69	17	64	14	13
53	38	83	28	74	21	68	16	63	13	12
54	37	82	27	73	20	67	15	62	12	11
55	36	81	26	72	19	66	14	61	11	10
56	35	80	25	71	18	65	13	60	10	09
57	34	79	24	70	17	64	12	59	09	08
58	33	78	23	69	16	63	11	58	08	07
59		77								

TABLE 7.]

PROPORTIONAL LOGARITHMS.

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S. "	h. m. 1° 28'	h. m. 1° 29'	h. m. 1° 30'	h. m. 1° 31'	h. m. 1° 32'	h. m. 1° 33'	h. m. 1° 34'	h. m. 1° 35'	h. m. 1° 36'	h. m. 1° 37'	h. m. 1° 38'
0	3108	3059	3010	2962	2915	2868	2821	2775	2730	2685	2640
1	07	58	09	62	14	67	21	75	29	84	40
2	06	57	09	61	13	66	20	74	29	84	39
3	05	56	08	60	12	66	19	73	28	83	38
4	05	56	07	59	12	65	18	72	27	82	38
5	04	55	06	58	11	64	18	72	26	81	37
6	03	54	05	58	10	63	17	71	25	81	36
7	02	53	05	57	09	62	16	70	25	80	35
8	01	52	04	56	09	62	15	69	24	79	35
9	01	52	03	55	08	61	15	69	23	78	34
10	3100	3051	3002	2954	2907	2860	2814	2768	2722	2678	2633
11	3099	50	01	54	06	59	13	67	22	77	32
12	98	49	01	53	05	59	12	66	21	76	32
13	97	48	00	52	05	58	11	66	20	75	31
14	96	47	2999	51	04	57	11	65	19	75	30
15	96	47	98	50	03	56	10	64	19	74	29
16	95	46	97	50	02	55	09	63	18	73	29
17	94	45	97	49	01	55	08	63	17	72	28
18	93	44	96	48	01	54	08	62	16	72	27
19	92	43	95	47	00	53	07	61	16	71	26
20	3091	3043	2994	2946	2899	2852	2806	2760	2715	2670	2626
21	91	42	93	46	98	52	05	60	14	69	25
22	90	41	93	45	98	51	05	59	13	69	24
23	89	40	92	44	97	50	04	58	13	68	24
24	88	39	91	43	96	49	03	57	12	67	23
25	87	39	90	42	95	48	02	56	11	66	22
26	87	38	89	42	94	48	01	56	10	66	21
27	86	37	89	41	94	47	01	55	10	65	21
28	85	36	88	40	93	46	00	54	09	64	20
29	84	35	87	39	92	45	2799	53	08	63	19
30	3083	3034	2986	2939	2891	2845	2798	2753	2707	2663	2618
31	82	34	85	38	91	44	98	52	07	62	18
32	82	33	85	37	90	43	97	51	06	61	17
33	81	32	84	36	89	42	96	50	05	60	16
34	80	31	83	35	88	42	95	50	04	60	15
35	79	30	82	35	87	41	95	49	04	59	15
36	78	30	81	34	87	40	94	48	03	58	14
37	78	29	81	33	86	39	93	47	02	57	13
38	77	28	80	32	85	38	92	47	01	57	12
39	76	27	79	31	84	38	92	46	01	56	12
40	3075	3026	2978	2931	2883	2837	2791	2745	2700	2655	2611
41	74	26	77	30	83	36	90	44	2699	55	10
42	73	25	77	29	82	35	89	44	98	54	10
43	73	24	76	28	81	35	88	43	93	53	09
44	72	23	75	27	80	34	88	42	97	52	08
45	71	22	74	27	80	33	87	41	96	52	07
46	70	22	73	26	79	32	86	41	95	51	07
47	69	21	73	25	78	31	85	40	95	50	06
48	69	20	72	24	77	31	85	39	94	49	05
49	68	19	71	24	76	30	84	38	93	49	04
50	3067	3018	2970	2923	2876	2829	2783	2738	2692	2648	2604
51	66	18	69	22	75	28	82	37	92	47	03
52	65	17	69	21	74	28	82	36	91	46	02
53	65	16	68	20	73	27	81	35	90	46	01
54	64	15	67	20	73	26	80	35	89	45	01
55	63	14	66	19	72	25	79	34	89	44	00
56	62	14	65	18	71	25	79	33	88	43	00
57	61	13	65	17	70	24	78	32	87	43	00
58	60	12	64	16	69	23	77	32	87	42	00
59	60	11	63	16	69	22	76	31	86	41	00

s. "	h. m. 1° 39'	h. m. 1° 40'	h. m. 1° 41'	h. m. 1° 42'	h. m. 1° 43'	h. m. 1° 44'	h. m. 1° 45'	h. m. 1° 46'	h. m. 1° 47'	h. m. 1° 48'	h. m. 1° 49'
0	2506	2553	2510	2487	2424	2382	2341	2300	2259	2218	2178
1	96	52	09	66	24	82	40	2299	58	18	78
2	95	51	08	65	23	81	39	98	58	17	77
3	94	51	07	65	22	80	39	98	57	16	76
4	93	50	07	64	22	80	38	97	56	15	75
5	93	49	06	63	21	79	37	96	55	14	74
6	92	48	05	62	20	78	37	96	55	14	74
7	91	48	04	62	19	78	36	95	54	13	73
8	91	47	04	61	19	77	35	94	53	12	72
9	90	46	03	60	18	76	35	94	53	12	72
10	2589	2545	2502	2460	2417	2375	2334	2293	2252	2212	2172
11	88	45	02	59	17	75	33	92	51	11	71
12	88	44	01	58	16	74	33	91	51	10	70
13	87	43	00	58	15	73	32	91	50	10	70
14	86	43	2499	57	15	73	31	90	49	09	69
15	85	42	99	56	14	72	31	89	49	08	68
16	85	41	98	55	13	71	30	89	48	08	68
17	84	40	97	55	12	71	29	88	47	07	67
18	83	40	97	54	12	70	28	87	47	06	66
19	83	39	96	53	11	69	28	87	46	06	66
20	2582	2538	2495	2453	2410	2368	2327	2286	2245	2205	2165
21	81	38	94	52	10	68	26	85	45	04	65
22	80	37	94	51	09	67	26	85	44	04	64
23	80	36	93	50	08	66	25	84	43	03	63
24	79	35	92	50	08	66	24	83	43	02	62
25	78	35	92	49	07	65	24	83	42	02	62
26	77	34	91	48	06	64	23	82	41	01	61
27	77	33	90	48	05	64	22	81	41	00	61
28	76	33	89	47	05	63	22	81	40	00	60
29	75	32	89	46	04	62	21	80	39	2199	59
30	2574	2531	2488	2445	2403	2362	2320	2279	2239	2198	2159
31	74	30	87	45	03	61	20	79	38	86	58
32	73	30	87	44	02	60	19	78	37	86	57
33	72	29	86	43	01	59	18	77	37	86	57
34	72	28	85	43	01	59	17	77	36	86	56
35	71	27	85	42	00	58	17	76	35	85	55
36	70	27	84	41	2399	57	16	75	35	84	55
37	69	26	83	41	98	57	15	74	34	84	54
38	69	25	82	40	98	56	15	74	33	83	53
39	68	25	82	39	97	55	14	73	33	82	53
40	2567	2524	2481	2438	2396	2355	2313	2272	2232	2192	2150
41	66	23	80	38	96	54	13	72	31	81	51
42	66	22	80	37	95	53	12	71	31	80	51
43	65	22	79	36	94	53	11	70	30	80	50
44	64	21	78	36	94	52	11	70	29	80	49
45	64	20	77	35	93	51	10	69	29	80	49
46	63	20	77	34	92	50	09	68	28	80	48
47	62	19	76	33	91	50	09	68	27	80	47
48	61	18	75	33	91	49	08	67	27	80	47
49	61	17	75	32	90	48	07	66	26	80	46
50	2560	2517	2474	2431	2389	2348	2307	2266	2225	2185	2145
51	59	16	73	31	89	47	06	65	25	80	45
52	59	15	72	30	88	46	05	64	24	80	44
53	58	15	72	29	87	46	04	64	23	80	44
54	57	14	71	29	87	45	04	63	23	80	43
55	56	13	70	28	86	44	03	62	22	80	43
56	56	12	70	27	85	44	02	62	21	80	42
57	55	12	69	26	84	43	02	61	20	80	41
58	54	11	68	26	84	42	01	60	20	80	40
59	53	10	67	25	83	42	00	60	19	80	40

TABLE 7.]

PROPORTIONAL LOGARITHMS.

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S. #	h. m. 1° 50'	h. m. 1° 51'	h. m. 1° 52'	h. m. 1° 53'	h. m. 1° 54'	h. m. 1° 55'	h. m. 1° 56'	h. m. 1° 57'	h. m. 1° 58'	h. m. 1° 59'	h. m. 2° 0'
0	2139	2089	2061	2022	1984	1946	1908	1871	1834	1797	1761
1	38	99	60	21	83	45	08	70	33	97	60
2	37	98	59	21	82	44	07	70	33	96	60
3	37	98	59	20	82	44	06	69	32	95	59
4	36	97	58	19	81	43	06	68	31	95	59
5	36	96	57	19	81	43	05	68	31	94	58
6	35	96	57	18	80	42	04	67	30	94	57
7	34	95	56	17	79	41	04	67	30	93	57
8	34	94	55	17	79	41	03	66	29	92	56
9	33	94	55	16	78	40	03	65	28	92	55
10	2132	2093	2054	2016	1977	1939	1902	1865	1828	1791	1755
11	32	92	53	15	77	39	01	64	27	91	54
12	31	92	53	14	76	38	01	63	27	90	54
13	30	91	52	14	75	38	00	63	26	89	53
14	30	90	52	13	75	37	1899	62	25	89	52
15	29	90	51	12	74	36	99	62	25	88	52
16	28	89	50	12	74	36	98	61	24	88	51
17	28	88	50	11	73	35	98	60	23	87	51
18	27	88	49	10	72	34	97	60	23	86	50
19	26	87	48	10	72	34	96	59	22	86	49
20	2126	2086	2048	2009	1971	1933	1896	1859	1822	1785	1749
21	25	86	47	09	70	33	95	58	21	85	48
22	24	85	46	08	70	32	94	57	20	84	48
23	24	85	46	07	69	31	94	57	20	83	47
24	23	84	45	07	68	31	93	56	19	83	46
25	22	83	44	06	68	30	93	55	19	82	46
26	22	83	44	05	67	29	92	55	18	81	45
27	21	82	43	05	67	29	91	54	17	81	45
28	20	81	42	04	66	28	91	54	17	80	44
29	20	81	42	03	65	28	90	53	16	80	43
30	2119	2080	2041	2003	1965	1927	1889	1852	1816	1779	1743
31	18	79	41	02	64	26	89	52	15	78	42
32	18	79	40	01	63	26	88	51	14	78	42
33	17	78	39	01	63	25	88	50	14	77	41
34	16	77	38	00	62	24	87	50	13	77	40
35	16	77	38	00	62	24	86	49	12	76	40
36	15	76	37	1999	61	23	86	49	12	75	39
37	15	75	37	98	60	23	85	48	11	75	39
38	14	75	36	98	60	22	84	47	11	74	38
39	13	74	35	97	59	21	84	47	10	74	37
40	2113	2073	2035	1996	1958	1921	1883	1846	1809	1773	1737
41	12	73	34	96	58	20	83	46	09	72	36
42	11	72	33	95	57	19	82	45	08	72	36
43	11	72	33	94	56	19	81	44	08	71	35
44	10	71	32	94	56	18	81	44	07	71	34
45	09	70	32	93	55	18	80	43	06	70	34
46	09	70	31	93	55	17	80	43	06	69	33
47	08	69	30	92	54	16	79	42	05	69	33
48	07	68	30	91	53	16	78	41	05	68	32
49	07	68	29	91	53	15	78	41	04	68	31
50	2106	2067	2028	1990	1952	1914	1877	1840	1803	1767	1731
51	05	66	28	89	51	14	76	39	03	66	30
52	05	66	27	89	51	13	76	39	02	66	30
53	04	65	26	88	50	13	75	38	02	65	29
54	03	64	26	87	50	12	75	38	01	65	28
55	03	64	25	87	49	11	74	37	00	64	28
56	02	63	25	86	48	11	73	36	00	63	27
57	01	62	24	86	48	10	73	36	1799	63	27
58	01	62	23	85	47	09	72	35	98	62	26
59	00	61	23	84	46	09	71	35	98	62	26

s. n	h. m. 1° 39'	h. m. 1° 40'	h. m. 1° 41'	h. m. 1° 42'	h. m. 1° 43'	h. m. 1° 44'	h. m. 1° 45'	h. m. 1° 46'	h. m. 1° 47'	h. m. 1° 48'	h. m. 1° 49'
0	2596	2553	2510	2467	2424	2382	2341	2300	2259	2218	2178
1	96	52	09	66	24	82	40	2299	58	18	78
2	95	51	08	65	23	81	39	98	58	17	77
3	94	51	07	65	22	80	39	98	57	16	76
4	93	50	07	64	22	80	38	97	56	16	76
5	93	49	06	63	21	79	37	96	56	15	75
6	92	48	06	62	20	78	37	96	55	14	74
7	91	48	04	62	19	78	36	95	54	14	74
8	91	47	04	61	19	77	35	94	53	13	73
9	90	46	03	60	18	76	35	94	53	12	72
10	2589	2545	2502	2460	2417	2375	2334	2293	2252	2212	2172
11	88	45	02	59	17	75	33	92	51	11	71
12	88	44	01	58	16	74	33	91	51	10	70
13	87	43	00	58	15	73	32	91	50	10	70
14	86	43	2499	57	15	73	31	90	49	09	69
15	85	42	89	56	14	72	31	89	49	08	68
16	85	41	88	55	13	71	30	89	48	08	68
17	84	40	87	55	12	71	29	88	47	07	67
18	83	40	87	54	12	70	28	87	47	06	67
19	83	39	86	53	11	69	28	87	46	06	66
20	2582	2538	2495	2453	2410	2368	2327	2286	2245	2205	2165
21	81	38	94	52	10	68	26	85	45	04	65
22	80	37	94	51	09	67	26	85	44	04	64
23	80	36	93	50	08	66	25	84	43	03	63
24	79	35	92	50	08	66	24	83	43	02	63
25	78	35	92	49	07	65	24	83	42	02	62
26	77	34	91	48	06	64	23	82	41	01	61
27	77	33	90	48	05	64	22	81	41	00	61
28	76	33	89	47	05	63	22	81	40	00	60
29	75	32	89	46	04	62	21	80	39	2199	59
30	2574	2531	2488	2445	2403	2362	2320	2279	2239	2198	2159
31	74	30	87	45	03	61	20	79	38	98	58
32	73	30	87	44	02	60	19	78	37	97	57
33	72	29	86	43	01	59	18	77	37	96	57
34	72	28	85	43	01	59	17	77	36	96	56
35	71	27	85	42	00	58	17	76	35	95	55
36	70	27	84	41	2389	57	16	75	35	94	55
37	69	26	83	41	98	57	15	74	34	94	54
38	69	25	82	40	98	56	15	74	33	93	53
39	68	25	82	39	97	55	14	73	33	92	53
40	2567	2524	2481	2438	2396	2355	2313	2272	2232	2192	2152
41	66	23	80	38	96	54	13	72	31	91	51
42	66	22	80	37	95	53	12	71	31	90	51
43	65	22	79	36	94	53	11	70	30	90	50
44	64	21	78	36	94	52	11	70	29	89	49
45	64	20	77	35	93	51	10	69	29	88	49
46	63	20	77	34	92	50	09	68	28	88	48
47	62	19	76	33	91	50	09	68	27	87	47
48	61	18	75	33	91	49	08	67	27	86	47
49	61	17	75	32	90	48	07	66	26	86	46
50	2560	2517	2474	2431	2389	2348	2307	2266	2225	2185	2145
51	59	16	73	31	89	47	06	65	25	84	45
52	59	15	72	30	88	46	05	64	24	84	44
53	58	15	72	29	87	46	04	64	23	83	43
54	57	14	71	29	87	45	04	63	23	82	43
55	56	13	70	28	86	44	03	62	22	82	42
56	56	12	70	27	85	44	02	62	21	81	41
57	55	12	69	26	84	43	02	61	20	80	40
58	54	11	68	26	84	42	01	60	20	79	39
59	53	10	67	25	83	42	00	60	19	78	38

TABLE 7.]

PROPORTIONAL LOGARITHMS.

111

S. #	h. m. 1° 50'	h. m. 1° 51'	h. m. 1° 52'	h. m. 1° 53'	h. m. 1° 54'	h. m. 1° 55'	h. m. 1° 56'	h. m. 1° 57'	h. m. 1° 58'	h. m. 1° 59'	h. m. 2° 0'
0	2139	2099	2061	2022	1984	1946	1908	1871	1834	1797	1761
1	38	99	60	21	83	45	08	70	33	97	60
2	37	98	59	21	82	44	07	70	33	96	60
3	37	98	59	20	82	44	06	69	32	95	59
4	36	97	58	19	81	43	06	68	31	95	59
5	36	96	57	19	81	43	05	68	31	94	58
6	35	96	57	18	80	42	04	67	30	94	57
7	34	95	56	17	79	41	04	67	30	93	57
8	34	94	55	17	79	41	03	66	29	92	56
9	33	94	55	16	78	40	03	65	28	92	55
10	2132	2093	2054	2016	1977	1939	1902	1865	1828	1791	1755
11	32	92	53	15	77	39	01	64	27	91	54
12	31	92	53	14	76	38	01	63	27	90	54
13	30	91	52	14	75	38	00	63	26	89	53
14	30	90	52	13	75	37	1899	62	25	89	52
15	29	90	51	12	74	36	99	62	25	88	52
16	28	89	50	12	74	36	98	61	24	88	51
17	28	88	50	11	73	35	98	60	23	87	51
18	27	88	49	10	72	34	97	60	23	86	50
19	26	87	48	10	72	34	96	59	22	86	49
20	2126	2086	2048	2009	1971	1933	1896	1859	1822	1785	1749
21	25	86	47	09	70	33	95	58	21	85	48
22	24	85	46	08	70	32	94	57	20	84	48
23	24	85	46	07	69	31	94	57	20	83	47
24	23	84	45	07	68	31	93	56	19	83	46
25	22	83	44	06	68	30	93	55	19	82	46
26	22	83	44	05	67	29	92	55	18	81	45
27	21	82	43	05	67	29	91	54	17	81	45
28	20	81	42	04	66	28	91	54	17	80	44
29	20	81	42	03	65	28	90	53	16	80	43
30	2119	2080	2041	2003	1965	1927	1889	1852	1816	1779	1743
31	18	79	41	02	64	26	89	52	15	79	42
32	18	79	40	01	63	26	88	51	14	78	42
33	17	78	39	01	63	25	88	50	14	77	41
34	16	77	38	00	62	24	87	50	13	77	40
35	16	77	38	00	62	24	86	49	12	76	40
36	15	76	37	1999	61	23	86	49	12	75	39
37	15	75	37	98	60	23	85	48	11	75	39
38	14	75	36	98	60	22	84	47	11	74	38
39	13	74	35	97	59	21	84	47	10	74	37
40	2113	2073	2035	1996	1958	1921	1883	1846	1809	1773	1737
41	12	73	34	96	58	20	83	46	09	72	36
42	11	72	33	95	57	19	82	45	08	72	36
43	11	72	33	94	56	19	81	44	08	71	35
44	10	71	32	94	56	18	81	44	07	71	34
45	09	70	32	93	55	18	80	43	06	70	34
46	09	70	31	93	55	17	80	43	06	69	33
47	08	69	30	92	54	16	79	42	05	69	33
48	07	68	30	91	53	16	78	41	05	68	32
49	07	68	29	91	53	15	78	41	04	68	31
50	2106	2067	2028	1990	1952	1914	1877	1840	1803	1767	1731
51	05	66	28	89	51	14	76	39	03	66	30
52	05	66	27	89	51	13	76	39	02	66	30
53	04	65	26	88	50	13	75	38	02	65	29
54	03	64	26	87	50	12	75	38	01	65	28
55	03	64	25	87	49	11	74	37	00	64	28
56	02	63	25	86	48	11	73	36	00	63	27
57	01	62	24	86	48	10	73	36	1799	63	27
58	01	62	23	85	47	09	72	35	98	62	26
59	00	61	23	84	46	09	71	35	98	62	25

s.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
"	1° 39'	1° 40'	1° 41'	1° 42'	1° 43'	1° 44'	1° 45'	1° 46'
0	2596	2553	2510	2467	2424	2382	2341	2300
1	96	52	09	68	24	82	40	229
2	95	51	08	65	23	81	39	9
3	94	51	07	65	22	80	39	9
4	93	50	07	64	22	80	38	9
5	93	49	06	63	21	79	37	9
6	92	48	05	62	20	78	37	9
7	91	48	04	62	19	78	36	9
8	91	47	04	61	19	77	35	9
9	90	46	03	60	18	76	35	9
10	2589	2545	2502	2460	2417	2375	2334	2293
11	88	45	02	59	17	75	33	9
12	88	44	01	58	16	74	33	9
13	87	43	00	58	15	73	32	9
14	86	43	2489	57	15	73	31	9
15	85	42	99	56	14	72	31	9
16	85	41	98	55	13	71	30	8
17	84	40	97	55	12	71	29	8
18	83	40	97	54	12	70	28	8
19	83	39	96	53	11	69	28	8
20	2582	2538	2495	2453	2410	2368	2327	2286
21	81	38	94	52	10	68	26	8
22	80	37	94	51	09	67	26	8
23	80	36	93	50	08	66	25	8
24	79	35	92	50	08	66	24	8
25	78	35	92	49	07	65	24	8
26	77	34	91	48	06	64	23	8
27	77	33	90	48	05	64	22	8
28	76	33	89	47	05	63	22	8
29	75	32	89	46	04	62	21	8
30	2574	2531	2488	2445	2403	2362	2320	2279
31	74	30	87	45	03	61	20	7
32	73	30	87	44	02	60	19	7
33	72	29	86	43	01	59	18	7
34	72	28	85	43	01	59	17	7
35	71	27	85	42	00	58	17	7
36	70	27	84	41	2399	57	16	7
37	69	26	83	41	98	57	15	7
38	69	25	82	40	98	56	15	7
39	68	25	82	39	97	55	14	7
40	2567	2524	2481	2438	2396	2355	2313	2272
41	66	23	80	38	96	54	13	7
42	66	22	80	37	95	53	12	7
43	65	22	79	36	94	53	11	7
44	64	21	78	36	94	52	11	7
45	64	20	77	35	93	51	10	6
46	63	20	77	34	92	50	09	6
47	62	19	76	33	91	50	09	6
48	61	18	75	33	91	49	08	6
49	61	17	75	32	90	48	07	6
50	2560	2517	2474	2431	2389	2348	2307	2266
51	59	16	73	31	89	47	06	6
52	59	15	72	30	88	46	05	6
53	58	15	72	29	87	46	04	6
54	57	14	71	29	87	45	04	6
55	56	13	70	28	86	44	03	6
56	56	12	70	27	85	44	02	6
57	55	12	69	26	84	43	02	6
58	54	11	68	26	84	42	01	6
59	53	10	67	25	83	42	00	6

s. "	h. m. 2° 1'	h. m. 2° 2'	h. m. 2° 3'	h. m. 2° 4'	h. m. 2° 5'	h. m. 2° 6'	h. m. 2° 7'	h. m. 2° 8'	h. m. 2° 9'	h. m. 2° 10'	h. m. 2° 11'
0	1725	1689	1654	1619	1584	1549	1515	1481	1447	1413	1380
1	24	89	53	18	83	48	14	80	46	13	79
2	24	88	52	17	82	48	14	79	46	12	79
3	23	87	52	17	82	47	13	79	45	12	78
4	22	87	51	16	81	47	12	78	45	11	78
5	22	86	51	16	81	46	12	78	44	11	77
6	21	86	50	15	80	46	11	77	43	10	77
7	21	85	50	14	80	45	11	77	43	09	76
8	20	84	49	14	79	44	10	76	42	09	76
9	19	84	48	13	78	44	10	76	42	08	75
10	1719	1683	1648	1613	1578	1543	1509	1475	1441	1408	1374
11	18	83	47	12	77	43	08	74	41	07	74
12	18	82	47	12	77	42	08	74	40	07	73
13	17	81	46	11	76	42	07	73	40	06	73
14	17	81	45	10	76	41	07	73	39	06	72
15	16	80	45	10	75	40	06	72	38	05	72
16	16	80	44	09	74	40	06	72	38	04	71
17	15	79	44	09	74	39	05	71	37	04	71
18	14	78	43	08	73	39	04	70	37	03	70
19	14	78	43	07	73	38	04	70	36	03	70
20	1713	1677	1642	1607	1572	1538	1503	1469	1436	1402	1369
21	12	77	41	06	71	37	03	69	35	02	68
22	12	76	41	06	71	36	02	68	35	01	68
23	11	76	40	05	70	36	02	68	34	01	67
24	11	75	40	05	70	35	01	67	33	00	67
25	10	74	39	04	69	35	00	67	33	1399	66
26	09	74	38	03	69	34	00	66	32	99	66
27	09	73	38	03	68	34	1499	65	32	98	65
28	08	73	37	02	67	33	99	65	31	98	65
29	08	72	37	02	67	32	98	64	31	97	64
30	1707	1671	1636	1601	1566	1532	1498	1464	1430	1397	1363
31	06	71	35	00	66	31	97	63	29	96	63
32	06	70	35	00	65	31	96	63	29	96	62
33	05	70	34	1599	65	30	96	62	28	95	62
34	05	69	34	99	64	30	95	61	28	94	61
35	04	68	33	98	63	29	95	61	27	94	61
36	03	68	33	98	63	28	94	60	27	93	60
37	03	67	32	97	62	28	94	60	26	93	60
38	02	67	31	96	62	27	93	59	26	92	59
39	02	66	31	96	61	27	93	59	25	92	59
40	1701	1665	1630	1595	1561	1526	1492	1458	1424	1391	1358
41	00	65	30	95	60	26	91	58	24	91	57
42	00	64	29	94	59	25	91	57	23	90	57
43	1699	64	28	93	59	24	90	56	23	89	56
44	89	63	28	93	58	24	90	56	22	89	56
45	98	63	27	92	58	23	89	55	22	88	55
46	97	62	27	92	57	23	89	55	21	88	55
47	97	61	26	91	56	22	88	54	21	87	54
48	96	61	26	91	56	22	87	54	20	87	54
49	96	60	25	90	55	21	87	53	19	86	53
50	1695	1660	1624	1589	1555	1520	1486	1452	1419	1386	1352
51	94	59	24	89	54	20	86	52	18	85	53
52	94	58	23	88	54	19	85	51	18	84	53
53	93	58	23	88	53	19	85	51	17	84	53
54	93	57	22	87	52	18	84	50	17	83	52
55	92	57	21	87	52	18	83	50	16	83	52
56	92	56	21	86	51	17	83	49	16	82	51
57	91	55	20	85	51	16	82	49	15	82	51
58	90	55	20	85	50	15	82	48	14	81	51
59	90	54	19	84	50	15	81	47	14	81	51

TABLE 7.]

PROPORTIONAL LOGARITHMS.

s. #	h. m. 2° 12'	h. m. 2° 13'	h. m. 2° 14'	h. m. 2° 15'	h. m. 2° 16'	h. m. 2° 17'	h. m. 2° 18'	h. m. 2° 19'	h. m. 2° 20'	h. m. 2° 21'	h. m. 2° 22'
0	1347	1314	1282	1249	1217	1185	1154	1123	1091	1061	1030
1	46	14	81	48	17	85	53	22	91	60	29
2	46	13	81	48	16	84	53	22	90	60	29
3	45	13	80	48	16	84	52	21	90	59	28
4	45	12	80	47	15	83	52	20	89	58	28
5	44	11	79	47	15	83	51	20	89	58	27
6	44	11	78	46	14	82	51	19	88	57	27
7	43	10	78	46	14	82	50	19	88	57	26
8	43	10	77	45	13	81	50	18	87	56	26
9	42	09	77	45	13	81	49	18	87	56	25
10	1342	1309	1276	1244	1212	1180	1149	1117	1086	1055	1025
11	41	08	76	43	11	80	48	17	86	55	24
12	40	08	75	43	11	79	48	16	85	54	24
13	40	07	75	42	10	79	47	16	85	54	23
14	39	07	74	42	10	78	47	15	84	53	23
15	39	06	74	41	09	78	46	15	84	53	22
16	38	06	73	41	09	77	46	14	83	52	22
17	38	05	73	40	08	77	45	14	83	52	21
18	37	04	72	40	08	76	45	13	82	51	21
19	37	04	71	39	07	75	44	13	82	51	20
20	1338	1303	1271	1239	1207	1175	1143	1112	1081	1050	1020
21	35	03	70	38	06	74	43	12	81	50	19
22	35	02	70	38	06	74	42	11	80	49	19
23	34	02	69	37	05	73	42	11	80	49	18
24	34	01	69	37	05	73	41	10	79	48	18
25	33	01	68	36	04	72	41	10	79	48	17
26	33	00	68	35	04	72	40	09	78	47	17
27	32	00	67	35	03	71	40	09	78	47	16
28	32	1209	67	34	02	71	39	08	77	46	16
29	31	98	66	34	02	70	39	08	76	46	15
30	1331	1298	1266	1233	1201	1170	1138	1107	1076	1045	1015
31	30	97	65	33	01	69	38	06	75	45	14
32	29	97	64	32	00	69	37	06	75	44	14
33	29	96	64	32	00	68	37	05	74	44	13
34	28	96	63	31	1199	68	36	05	74	43	13
35	28	95	63	31	99	67	36	04	73	43	12
36	27	95	62	30	98	67	35	04	73	42	12
37	27	94	62	30	98	66	35	03	72	42	11
38	26	94	61	29	97	65	34	03	72	41	11
39	26	93	61	29	97	65	34	02	71	41	10
40	1325	1292	1260	1228	1196	1164	1133	1102	1071	1040	1009
41	25	92	60	27	96	64	32	01	70	40	09
42	24	91	59	27	95	63	32	01	70	39	08
43	23	91	59	26	95	63	31	00	69	39	08
44	23	90	58	26	94	62	31	00	69	38	07
45	22	90	57	25	93	62	30	1009	68	37	07
46	22	89	57	25	93	61	30	99	68	37	06
47	21	89	56	24	92	61	29	98	67	36	06
48	21	88	56	24	92	60	29	98	67	36	05
49	20	88	55	23	91	60	28	97	66	35	05
50	1320	1287	1255	1223	1191	1159	1128	1097	1066	1035	1004
51	19	87	54	22	90	59	27	96	65	34	04
52	19	86	54	22	90	58	27	96	65	34	03
53	18	85	53	21	89	58	26	95	64	33	03
54	17	85	53	21	89	57	26	95	64	33	02
55	17	84	52	20	88	57	25	94	63	32	02
56	16	84	52	19	88	56	25	94	63	32	01
57	16	83	51	19	87	56	24	93	62	31	01
58	15	83	50	18	87	55	24	92	62	31	00
59	15	82	50	18	86	54	23	92	61	30	00

s.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
"	2° 23'	2° 24'	2° 25'	2° 26'	2° 27'	2° 28'	2° 29'	2° 30'	2° 31'	2° 32'	2° 33'	h. m.
0	0999	0969	0939	0909	0880	0850	0821	0792	0763	0734	0706	06
1	99	69	39	09	79	50	20	91	62	34	06	05
2	98	68	38	08	79	49	20	91	62	33	05	05
3	98	68	38	08	78	49	19	90	62	33	04	05
4	97	67	37	07	78	48	19	90	61	32	04	04
5	97	67	37	07	77	48	18	89	61	32	03	04
6	96	66	36	06	77	47	18	89	60	31	03	03
7	96	66	36	06	76	47	17	88	60	31	02	03
8	95	65	35	05	76	46	17	88	59	30	02	02
9	95	65	35	05	75	46	16	87	59	30	01	02
10	0994	0964	0934	0904	0875	0845	0816	0787	0758	0730	0701	01
11	94	64	34	04	74	45	16	87	58	29	01	01
12	93	63	33	03	74	44	15	86	57	29	00	01
13	93	63	33	03	73	44	15	86	57	28	00	00
14	92	62	32	02	73	43	14	85	56	28	00	00
15	92	62	32	02	72	43	14	85	56	27	00	00
16	91	61	31	01	72	42	13	84	55	27	00	00
17	91	61	31	01	71	42	13	84	55	26	00	00
18	90	60	30	00	71	41	12	83	54	26	00	00
19	90	60	30	00	70	41	12	83	54	25	00	00
20	0989	0959	0929	0899	0870	0840	0811	0782	0753	0725	0697	00
21	89	59	29	99	69	40	11	82	53	24	00	00
22	88	58	28	98	69	39	10	81	52	24	00	00
23	88	58	28	98	68	39	10	81	52	23	00	00
24	87	57	27	97	68	38	09	80	51	23	00	00
25	87	57	27	97	67	38	09	80	51	22	00	00
26	86	56	26	96	67	37	08	79	51	22	00	00
27	86	56	26	96	66	37	08	79	50	21	00	00
28	85	55	25	95	66	36	07	78	50	21	00	00
29	85	55	25	95	65	36	07	78	49	21	00	00
30	0984	0954	0924	0894	0865	0835	0806	0777	0749	0720	0692	00
31	84	54	24	94	64	35	06	77	48	20	00	00
32	83	53	23	93	64	34	05	76	48	19	00	00
33	83	53	23	93	63	34	05	76	47	19	00	00
34	82	52	22	92	63	34	04	75	47	18	00	00
35	82	52	22	92	62	33	04	75	46	18	00	00
36	81	51	21	91	62	33	03	74	46	17	00	00
37	81	51	21	91	61	32	03	74	45	17	00	00
38	80	50	20	90	61	32	02	74	45	16	00	00
39	80	50	20	90	60	31	02	73	44	16	00	00
40	0979	0949	0919	0889	0860	0831	0801	0773	0744	0715	0687	00
41	79	49	19	89	59	30	01	72	43	15	00	00
42	78	48	18	88	59	30	01	72	43	14	00	00
43	78	48	18	88	58	29	00	71	42	14	00	00
44	77	47	17	87	58	29	00	71	42	13	00	00
45	77	47	17	87	57	28	0799	70	41	13	00	00
46	76	46	16	86	57	28	99	70	41	12	00	00
47	76	46	16	86	56	27	98	69	40	12	00	00
48	75	45	15	85	56	27	98	69	40	11	00	00
49	75	45	15	85	55	26	97	68	40	11	00	00
50	0974	0944	0914	0884	0855	0826	0797	0768	0739	0711	0683	00
51	74	44	14	84	55	25	96	67	39	10	00	00
52	73	43	13	83	54	25	96	67	38	10	00	00
53	73	43	13	83	53	24	95	66	38	09	00	00
54	72	42	12	82	53	24	95	66	37	09	00	00
55	72	42	12	82	52	23	94	65	37	08	00	00
56	71	41	11	81	52	22	93	64	36	08	00	00
57	71	41	11	81	51	22	93	64	35	08	00	00
58	70	40	10	80	51	21	92	63	35	07	00	00
59	70	40	10	80	50	21	92	63	34	07	00	00

h. m. 2° 35'	h. m. 2° 36'	h. m. 2° 37'	h. m. 2° 38'	h. m. 2° 39'	h. m. 2° 40'	h. m. 2° 41'	h. m. 2° 42'	h. m. 2° 43'	h. m. 2° 44'
0649	0621	0594	0566	0539	0512	0484	0458	0431	0404
49	21	93	66	38	11	84	57	30	04
48	21	93	65	38	11	84	57	30	08
48	20	92	65	37	10	83	56	30	03
48	20	92	64	37	10	83	56	29	08
47	19	91	64	36	09	82	55	29	02
47	19	91	63	36	09	82	55	28	02
46	18	91	63	36	08	81	54	28	01
46	18	90	62	35	08	81	54	27	01
45	17	90	62	35	07	80	54	27	00
0645	0617	0589	0562	0534	0507	0480	0453	0426	0400
44	16	89	61	34	07	80	53	26	0399
44	16	88	61	33	06	79	52	26	99
43	15	88	60	33	06	79	52	25	99
43	15	87	60	32	05	78	51	25	98
42	15	87	59	32	05	78	51	24	98
42	14	86	59	31	04	77	50	24	97
41	14	86	58	31	04	77	50	23	97
41	13	85	58	31	03	76	50	23	96
41	13	85	57	30	03	76	49	22	96
0640	0612	0585	0557	0530	0502	0475	0449	0422	0395
40	12	84	57	29	02	75	48	22	95
39	11	84	56	29	02	75	48	21	95
39	11	83	56	28	01	74	47	21	94
38	10	83	55	28	01	74	47	20	94
38	10	82	55	27	00	73	46	20	93
37	09	82	54	27	00	73	46	19	93
37	09	81	54	26	0499	72	46	19	92
36	09	81	53	26	99	72	45	18	92
36	08	80	53	26	98	71	45	18	91
0635	0608	0580	0552	0525	0498	0471	0444	0418	0391
35	07	79	52	25	98	71	44	17	91
34	07	79	52	24	97	70	43	17	90
34	06	79	51	24	97	70	43	16	90
34	06	78	51	23	96	69	42	16	89
33	05	78	50	23	96	69	42	15	89
33	05	77	50	22	95	68	42	15	88
32	04	77	49	22	95	68	41	14	88
32	04	76	49	21	94	67	41	14	88
31	03	76	48	21	94	67	40	14	87
0631	0603	0575	0548	0521	0493	0467	0440	0413	0387
30	02	75	47	20	93	66	39	13	86
30	02	74	47	20	93	66	39	12	86
29	02	74	46	19	92	65	38	12	85
29	01	73	46	19	92	65	38	11	85
28	01	73	46	18	91	64	38	11	84
28	00	73	45	18	91	64	37	10	84
28	00	72	45	17	90	63	37	10	84
27	0599	72	44	17	90	63	36	10	83
27	99	71	44	17	89	62	36	09	83
0626	0598	0571	0543	0516	0489	0462	0435	0409	0382
26	98	70	43	16	89	62	35	08	82
25	97	70	42	15	88	61	34	08	81
25	97	69	42	15	88	61	34	07	81
24	96	69	41	14	87	60	34	07	81
24	96	68	41	14	87	60	33	06	80
23	96	68	41	13	86	59	33	06	80
23	95	68	40	13	86	59	32	06	80
22	95	67	40	12	85	58	32	06	80
22	94	67	39	12	85	58	31	05	79

s.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
"	2° 45'	2° 46'	2° 47'	2° 48'	2° 49'	2° 50'	2° 51'	2° 52'	2° 53'	2° 54'	
0	0378	0352	0326	0300	0274	0248	0223	0197	0172	0147	
1	77	51	25	0299	73	48	22	97	72	47	
2	77	51	25	99	73	47	22	97	71	46	
3	77	50	24	98	73	47	21	96	71	46	
4	76	50	24	98	72	47	21	96	71	46	
5	76	49	23	97	72	46	21	95	70	45	
6	75	49	23	97	71	46	20	95	70	45	
7	75	49	23	97	71	45	20	94	69	44	
8	74	48	22	96	70	45	19	94	69	44	
9	74	48	22	96	70	44	19	94	69	43	
10	0374	0347	0321	0295	0270	0244	0219	0193	0168	0143	
11	73	47	21	95	69	44	18	93	68	43	
12	73	46	20	94	69	43	18	92	67	42	
13	72	46	20	94	68	43	17	92	67	42	
14	72	46	19	94	68	42	17	92	66	41	
15	71	45	19	93	67	42	16	91	66	41	
16	71	45	19	93	67	41	16	91	66	41	
17	70	44	18	92	67	41	16	90	65	40	
18	70	44	18	92	66	41	15	90	65	40	
19	70	43	17	91	66	40	15	89	64	39	
20	0369	0343	0317	0291	0265	0240	0214	0189	0164	0139	
21	69	42	16	91	65	39	14	89	63	38	
22	68	42	16	90	64	39	13	88	63	38	
23	68	42	16	90	64	38	13	88	63	38	
24	67	41	15	89	64	38	13	87	62	37	
25	67	41	15	89	63	38	12	87	62	37	
26	66	40	14	88	63	37	12	87	61	36	
27	66	40	14	88	62	37	11	86	61	36	
28	66	39	13	88	62	36	11	86	61	36	
29	65	39	13	87	61	36	11	85	60	35	
30	0365	0339	0313	0287	0261	0235	0210	0185	0160	0135	
31	64	38	12	86	61	35	10	84	59	34	
32	64	38	12	86	60	35	09	84	59	34	
33	63	37	11	85	60	34	09	84	58	34	
34	63	37	11	85	59	34	08	83	58	33	
35	63	36	10	85	59	33	08	83	58	33	
36	62	36	10	84	58	33	08	82	57	32	
37	62	36	10	84	58	33	07	82	57	32	
38	61	35	09	83	58	32	07	81	56	31	
39	61	35	09	83	57	32	06	81	56	31	
40	0360	0334	0308	0282	0257	0231	0206	0181	0156	0131	
41	60	34	08	82	56	31	05	80	55	30	
42	59	33	07	82	56	30	05	80	55	30	
43	59	33	07	81	55	30	05	79	54	29	
44	59	33	07	81	55	30	04	79	54	29	
45	58	32	06	80	55	29	04	79	53	29	
46	58	32	06	80	54	29	03	78	53	28	
47	57	31	05	79	54	28	03	78	53	28	
48	57	31	05	79	53	28	02	77	52	27	
49	56	30	04	79	53	27	02	77	52	27	
50	0356	0330	0304	0278	0252	0227	0202	0176	0151	0126	
51	56	29	04	78	52	27	01	76	51	26	
52	55	29	03	77	52	26	01	76	51	26	
53	55	29	03	77	51	26	00	75	50	25	
54	54	28	02	76	51	25	00	75	50	25	
55	54	28	02	76	50	25	00	74	49	24	
56	53	27	01	75	50	24	0199	74	49	24	
57	53	27	01	75	50	24	99	74	48	24	
58	53	26	00	75	49	24	98	73	48	23	
59	52	26	00	74	49	23	98	73	48	23	

TABLE 7.1

PROPORTIONAL LOGARITHMS.

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s. "	h. m. 2° 56'	h. m. 2° 57'	h. m. 2° 58'	h. m. 2° 59'	s. "	h. m. 2° 56'	h. m. 2° 57'	h. m. 2° 58'	h. m. 2° 59'
0	0088	0073	0049	0024	30	0085	0061	0036	0012
1	97	73	48	24	31	85	60	36	12
2	97	72	48	23	32	84	60	36	11
3	96	72	47	23	33	84	60	35	11
4	96	71	47	23	34	84	59	35	10
5	96	71	46	22	35	83	59	34	10
6	95	71	46	22	36	83	58	34	10
7	95	70	46	21	37	82	58	34	09
8	94	70	45	21	38	82	57	33	09
9	94	69	45	21	39	82	57	33	08
10	0083	0069	0044	0020	40	0081	0057	0032	0008
11	83	68	44	20	41	81	56	32	08
12	93	68	44	19	42	80	56	31	07
13	92	68	43	19	43	80	55	31	07
14	92	67	43	19	44	80	55	31	06
15	91	67	42	18	45	79	55	30	06
16	91	66	42	18	46	79	54	30	06
17	91	66	42	17	47	78	54	29	05
18	90	66	41	17	48	78	53	29	05
19	90	65	41	17	49	77	53	29	04
20	0089	0065	0040	0016	50	0077	0053	0028	0004
21	89	64	40	16	51	77	52	28	04
22	89	64	40	15	52	76	52	27	03
23	88	64	39	15	53	76	51	27	03
24	88	63	39	15	54	75	51	27	02
25	87	63	38	14	55	75	51	26	02
26	87	62	38	14	56	75	50	26	02
27	87	62	38	13	57	74	50	25	01
28	86	62	37	13	58	74	49	25	01
29	86	61	37	12	59	73	49	25	00

TABLE 8.

FOR FINDING THE DISTANCE OF OBJECTS AT SEA.

Ht. of eye in feet.	Dist. in miles.	Ht. of eye in feet.	Dist. in miles.	Ht. of eye in feet.	Dist. in miles.	Ht. of eye in feet.	Dist. in miles.	Ht. of eye in feet.	Dist. in miles.	Height of eye in feet.	Dist. in miles.	Height of eye in feet.	Dist. in miles.
1	1.15	25	5.74	49	8.0	180	15.4	420	23.5	820	32.9	2500	57.4
2	1.62	26	5.56	50	8.1	190	15.8	430	23.8	840	33.3	2600	58.6
3	1.99	27	5.97	55	8.5	200	16.2	440	24.1	860	33.7	2700	59.7
4	2.30	28	6.08	60	8.9	210	16.6	450	24.4	880	34.1	2800	60.8
5	2.57	29	6.18	65	9.3	220	17.0	460	24.6	900	34.5	2900	61.8
6	2.81	30	6.30	70	9.6	230	17.4	470	24.9	920	34.8	3000	63.0
7	3.04	31	6.40	75	9.9	240	17.8	480	25.2	940	35.2	3100	64.0
8	3.25	32	6.50	80	10.3	250	18.2	490	25.4	960	35.6	3200	65.0
9	3.45	33	6.60	85	10.6	260	18.5	500	25.7	980	36.0	3300	66.0
10	3.63	34	6.70	90	10.9	270	18.9	520	26.2	1000	36.3	3400	67.0
11	3.81	35	6.80	95	11.2	280	19.2	540	26.7	1100	38.1	3500	68.0
12	3.98	36	6.90	100	11.5	290	19.6	560	27.2	1200	39.8	3600	69.0
13	4.14	37	6.99	105	11.8	300	19.9	580	27.7	1300	41.4	3700	69.9
14	4.30	38	7.09	110	12.1	310	20.2	600	28.1	1400	43.0	3800	70.9
15	4.45	39	7.17	115	12.3	320	20.6	620	28.6	1500	44.5	3900	71.7
16	4.60	40	7.27	120	12.6	330	20.9	640	29.1	1600	46.0	4000	72.7
17	4.73	41	7.36	125	12.8	340	21.2	660	29.5	1700	47.3	4100	73.6
18	4.87	42	7.44	130	13.1	350	21.5	680	30.0	1800	48.7	4200	74.4
19	5.01	43	7.54	135	13.3	360	21.8	700	30.4	1900	50.1	4300	75.4
20	5.14	44	7.62	140	13.6	370	22.1	720	30.8	2000	51.4	4400	76.1
21	5.26	45	7.70	145	13.8	380	22.4	740	31.2	2100	52.6	4500	77.0
22	5.39	46	7.79	150	14.1	390	22.7	760	31.7	2200	53.9	4600	77.8
23	5.51	47	7.88	160	14.5	400	23.0	780	32.1	2300	55.1	5000	81.2
24	5.62	48	7.96	170	15.0	410	23.3	800	32.5	2400	56.2	5100	82.5

TABLE 9.

118		MEAN TIMES OF TRANSITS OF PRINCIPAL STARS.						[TABLE 9]	
Declina- tion.		JANUARY.			FEBRUARY.				
		1.	11.	21.	1.	11.	21.		
° ,		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.		
28 19 N.	α Androm. ...	5 16	4 37	3 58	3 15	2 36	1 57	1 57	1 57
14 24 N.	γ Pegasi ...	21	42	4 3	20	40	1 14	1 14	1 14
78 3 S.	β Hydri ...	34	55	16	33	53	2 28	2 28	2 28
55 46 N.	α Cassiop. ...	48	5 9	29	46	3 6	2 11	2 11	2 11
18 46 S.	β Ceti ...	52	18	33	51	11	1 11	1 11	1 11
86 33 N.	Pole Star ...	6 19	5 40	5 0	4 17	3 36	2 55	2 55	2 55
8 55 S.	β Ceti ...	32	53	13	30	50	1 40	1 40	1 40
57 58 S.	α Eridani ...	48	6 9	29	46	4 6	3 11	3 11	3 11
23 48 N.	α Arietis ...	7 14	35	55	5 13	32	2 42	2 42	2 42
2 36 N.	γ Ceti ...	51	7 12	6 32	50	5 10	4 20	4 20	4 20
3 32 N.	α Ceti ...	8 10	7 31	6 51	6 8	5 28	4 38	4 38	4 38
49 21 N.	α Persel ...	29	50	7 10	27	47	3 57	3 57	3 57
23 40 N.	γ Tauri ...	54	8 15	35	53	6 13	5 23	5 23	5 23
13 55 S.	γ Eridani ...	9 7	28	48	7 6	26	6 36	6 36	6 36
16 13 N.	α Tauri ...	43	9 4	8 24	41	7 1	6 11	6 11	6 11
45 51 N.	α Aurigæ ...	10 20	9 42	9 2	8 19	7 39	6 49	6 49	6 49
8 22 S.	β Orionis ...	22	44	4	21	41	3 11	3 11	3 11
28 29 N.	β Tauri ...	32	52	14	31	51	2 21	2 21	2 21
0 24 S.	β Orionis ...	39	10 0	21	28	58	1 58	1 58	1 58
17 56 S.	α Leporis ...	41	2	23	40	8 0	1 40	1 40	1 40
1 18 S.	α Orionis ...	10 43	10 4	9 25	8 42	8 2	7 12	7 12	7 12
34 9 S.	α Columba ...	49	10	31	45	5	6 5	6 5	6 5
7 23 N.	α Orionis ...	11 2	23	44	9 1	21	7 11	7 11	7 11
22 36 N.	μ Geminor ...	29	50	10 10	28	48	6 58	6 58	6 58
52 37 S.	α Argus ...	36	57	17	35	55	6 55	6 55	6 55
87 15 N.	51 Cephei ...	11 42	11 3	10 23	9 41	9 1	8 11	8 11	8 11
16 31 S.	α Canis Maj.	53	14	34	52	12	7 12	7 12	7 12
28 47 S.	α Canis Maj.	12 8	29	49	10 6	27	6 27	6 27	6 27
22 14 N.	β Geminor ...	26	47	11 7	24	45	6 45	6 45	6 45
32 12 N.	α Geminor ...	40	12 1	21	38	58	6 58	6 58	6 58
5 35 N.	α Canis Min.	12 46	12 7	11 27	10 44	10 4	9 4	9 4	9 4
28 22 N.	β Geminor ...	51	12	32	49	10	8 10	8 10	8 10
23 54 S.	15 Argus ...	13 16	37	57	11 14	34	10 34	10 34	10 34
6 56 N.	α Hydre ...	54	18 15	12 35	52	11 13	10 23	10 23	10 23
48 36 N.	α Ursæ Maj.	14 4	25	45	12 2	23	11 23	11 23	11 23
58 41 S.	α Argus ...	14 28	13 49	13 9	12 26	11 46	11 46	11 46	11 46
8 3 S.	α Hydre ...	35	56	16	33	53	10 53	10 53	10 53
52 19 N.	α Ursæ Maj.	38	59	19	36	56	10 56	10 56	10 56
24 26 N.	α Leonis ...	52	14 18	33	50	13 10	12 10	12 10	12 10
12 40 N.	α Leonis ...	15 15	36	56	13 13	33	12 33	12 33	12 33
20 33 N.	γ Leonis ...	15 26	14 47	14 7	13 24	12 44	12 44	12 44	12 44
58 56 S.	α Argus ...	52	15 15	35	52	13 12	12 12	12 12	12 12
62 31 N.	α Ursæ Maj.	16 8	30	50	14 7	27	12 27	12 27	12 27
21 18 S.	β Leonis ...	20	42	15 2	19	39	12 39	12 39	12 39
14 1 S.	β Hydre ...	26	48	8	25	45	12 45	12 45	12 45
15 22 N.	β Leonis ...	16 55	16 16	15 37	14 54	14 14	13 14	13 14	13 14
54 39 N.	γ Ursæ Maj.	17 0	21	42	59	19	13 19	13 19	13 19
78 31 S.	β Chamæ. ...	23	44	16 4	15 22	42	13 42	13 42	13 42
62 19 S.	α Crucis ...	32	53	13	31	51	13 51	13 51	13 51
22 37 S.	β Corvi ...	40	17 1	21	36	56	14 56	14 56	14 56

		JANUARY.			FEBRUARY.		
		1.	11.	21.	1.	11.	21.
		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
N.	12 Can. Ven.	18 3	17 24	16 44	16 1	15 22	14 43
S.	α Virginis ...	31	52	17 12	29	50	15 11
N.	γ Ursæ Maj.	55	18 16	36	53	16 13	35
N.	γ Bootis	19 1	22	42	59	19	41
S.	β Centauri ...	7	28	48	17 5	25	47
N.	α Bootis	19 23	18 44	18 4	17 21	16 41	16 2
S.	α Centauri ...	43	19 4	24	41	17 1	22
N.	α Bootis	52	13	33	50	10	31
S.	α Libræ	56	17	37	54	14	35
N.	β Ursæ Min.	20 5	26	46	18 3	17 23	44
S.	β Libræ	20 23	19 44	19 4	18 21	17 41	17 2
N.	α Coro. Bor.	42	20 3	23	40	18 0	21
N.	α Serpentis...	51	12	32	49	9	30
N.	ζ Ursæ Min.	21 4	25	45	19 2	22	43
S.	β Scorpil.....	10	31	51	8	28	49
S.	δ Ophiuchi...	21 20	20 41	20 1	19 18	18 38	17 59
S.	α Scorpil	34	55	15	32	52	18 13
N.	γ Draconis ...	36	57	17	34	54	15
S.	α Triæ. Aust.	46	21 7	27	44	19 4	25
N.	α Ursæ Min.	22 16	37	57	20 14	34	55
N.	α Herculis ...	22 22	21 43	21 3	20 20	19 40	19 1
N.	β Draconis ...	44	22 5	25	42	20 2	23
N.	α Ophiuchi...	45	6	26	43	3	24
S.	γ Octantis ...	23 0	30	40	57	18	39
N.	γ Draconis ...	6	27	48	21 5	25	46
S.	μ ¹ Sagittari...	23 18	22 39	22 0	21 17	20 37	19 58
N.	δ Ursæ Min.	35	53	16	34	54	20 15
N.	α Lyræ	45	23 6	26	44	21 4	25
N.	β Lyræ	57	18	38	56	16	37
N.	ζ Aquilæ.....	0 15	36	56	22 13	34	54
N.	δ Aquilæ.....	0 35	23 56	23 16	22 33	21 54	21 14
N.	γ Aquilæ.....	56	0 17	37	54	22 14	34
N.	α Aquilæ.....	1 0	21	41	58	18	38
N.	β Aquilæ.....	5	26	46	23 3	23	43
N.	λ Ursæ Min.	21	42	0 2	19	39	59
N.	α Capricor. .	1 27	0 48	0 8	23 25	22 45	22 6
N.	α Pavonis ...	31	52	12	28	48	9
N.	α Cygni	53	1 14	34	47	23 7	28
N.	61 ¹ Cygni	2 17	38	58	0 15	31	52
N.	ζ Cygni	23	44	1 4	21	37	58
N.	α Cephei.....	2 32	1 53	1 13	0 30	23 46	23 7
N.	β Aquarii ...	40	2 1	21	33	54	15
N.	β Cephei.....	44	5	25	42	0 2	19
N.	α Pegasi.....	54	15	35	52	12	29
N.	α Aquarii ...	3 15	36	56	1 13	33	50
N.	α Grulis ...	3 15	2 36	1 56	1 13	0 33	23 50
N.	ζ Pegasi.....	51	3 12	2 32	49	1 9	0 30
N.	α Pisc. Aus.	4 5	27	47	2 4	24	45
N.	α Pegasi.....	13	35	55	12	32	53
N.	α Piscium ...	48	4 10	3 30	47	2 7	1 38

Declina- tion.		MARCH.			APRIL.		
		1.	11.	21.	1.	11.	21.
° ' "		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
28 19 N.	α Androm. ...	1 24	0 45	0 6	23 18	23 39	
14 24 N.	γ Pegasi	29	50	11	23	44	
78 3 S.	β Hydri	42	1 3	24	36	57	
55 46 N.	α Cassiop. ...	56	17	38	50	23 11	
18 46 S.	β Ceti	2 0	21	42	54	15	
88 33 N.	Pole Star	2 27	1 48	1 9	0 25	23 42	
8 55 S.	β Ceti	40	2 1	22	38	55	
57 58 S.	α Eridani ...	56	17	38	54	0 15	
22 48 N.	α Arietis	3 22	43	2 4	1 20	41	
2 38 N.	γ Ceti	59	3 20	41	57	1 18	
3 32 N.	α Ceti	4 17	3 39	3 0	2 16	1 37	
49 21 N.	α Persai	36	53	19	35	56	
23 40 N.	α Tauri	5 2	4 23	44	3 0	2 21	
13 55 S.	γ Eridani ...	15	36	57	13	34	
16 13 N.	α Tauri	50	5 11	4 32	49	3 10	
45 51 N.	α Aurigæ ...	6 23	5 49	5 10	4 26	3 48	
8 22 S.	β Orionis	30	51	12	28	50	
28 29 N.	β Tauri	40	6 1	22	38	59	
0 24 S.	δ Orionis	47	8	29	45	4 6	
17 56 S.	α Leporis	49	10	31	47	8	
1 18 S.	α Orionis	6 51	6 12	5 33	4 19	4 10	
34 9 S.	α Columbe ...	57	18	39	55	16	
7 23 N.	α Orionis ...	7 10	31	52	5 8	29	
22 35 N.	μ Geminor. ...	37	58	6 19	35	55	
52 37 S.	α Argus	44	7 5	26	42	5 3	
37 15 N.	51 Cephei	7 50	7 11	6 32	5 48	5 9	
16 31 S.	α Canis Maj. ...	8 1	22	43	59	20	
28 47 S.	α Canis Maj. ...	16	37	58	6 14	35	
22 14 N.	β Geminor. ...	34	55	7 16	32	53	
32 12 N.	α Geminor. ...	48	8 9	30	46	6 7	
5 35 N.	α Canis Min. ...	8 54	8 15	7 38	6 52	6 13	
28 22 N.	β Geminor. ...	59	20	41	57	18	
23 54 S.	15 Argus	9 24	45	8 6	7 22	43	
6 58 N.	α Hydæ	10 2	9 23	44	8 0	7 21	
48 36 N.	α Uræ Maj. ...	12	33	54	10	31	
58 41 S.	α Argus	10 35	9 57	9 18	8 34	7 55	
8 3 S.	α Hydæ	42	10 3	25	41	8 9	
52 19 N.	θ Uræ Maj. ...	45	6	28	44	5	
24 26 N.	α Leonis	59	20	42	58	19	
12 40 N.	α Leonis	11 22	43	10 4	9 21	43	
20 33 N.	γ Leonis	11 33	10 54	10 15	9 32	8 53	
58 56 S.	α Argus	12 1	11 22	43	10 0	9 21	
62 31 N.	α Uræ Maj. ...	16	37	53	14	36	
21 18 N.	β Leonis	28	49	11 10	26	48	
14 1 S.	β Hydæ	34	55	16	32	54	
15 22 N.	β Leonis ...	13 8	12 24	11 45	11 1	10 22	
54 29 N.	γ Uræ Maj. ...	8	29	50	6	27	
78 31 S.	β Chamæl. ...	31	52	12 13	29	50	
62 19 S.	α Crucis	40	13 1	22	38	59	
22 37 S.	β Corvi	48	9	30	46	11 7	

	MARCH.			APRIL.		
	1.	11.	21.	1.	11.	21.
	<i>h. m.</i>	<i>h. m.</i>	<i>h. m.</i>	<i>h. m.</i>	<i>h. m.</i>	<i>h. m.</i>
Can. Ven.	14 11	13 32	12 53	12 9	11 30	10 50
Virginis ...	39	14 0	13 21	37	58	11 18
Ursæ Maj.	15 8	24	45	13 1	12 22	42
Bootis	9	30	51	7	28	48
Centauri ...	15	36	57	13	34	54
Bootis	15 31	14 52	14 13	13 29	12 50	12 10
Centauri ...	51	15 12	33	49	13 10	80
Bootis	16 0	21	42	58	19	39
Libræ	4	25	46	14 2	23	43
Ursæ Min.	13	34	55	11	32	52
Libræ	16 30	15 52	15 13	14 29	13 50	13 10
Coræ Bor.	49	16 10	32	48	14 9	29
Serpentis...	58	19	41	57	18	38
Ursæ Min.	17 11	32	53	15 10	31	51
Scorpii	17	38	58	16	37	57
Ophiuchi ...	17 27	16 48	16 9	15 26	14 47	14 7
Scorpii	41	17 2	23	40	15 1	21
Draconis ...	43	4	25	42	3	23
Triæ. Aust.	53	14	35	52	13	33
Ursæ Min.	18 23	44	17 5	16 22	43	15 8
Herculis ...	18 29	17 50	17 11	16 28	15 49	15 9
Draconis ...	51	18 11	32	48	16 8	28
Ophiuchi ...	52	12	33	49	9	29
Octantis ...	19 8	28	49	17 5	25	45
Draconis ...	14	35	56	12	33	54
Sagittarii...	19 26	18 47	18 8	17 24	16 45	16 6
Ursæ Min.	43	19 4	25	41	17 2	22
Lyre.....	53	14	35	51	12	32
Lyre.....	20 5	26	47	18 3	24	44
Aquilæ.....	23	44	19 15	21	42	16 2
Aquilæ	20 42	20 3	19 24	18 40	18 1	17 21
Aquilæ	21 2	22	42	58	18 19	39
Aquilæ	6	26	46	19 2	23	43
Aquilæ	9	30	51	7	28	48
Ursæ Min.	28	49	20 9	25	46	18 6
Capricor. ...	21 34	20 55	20 15	19 31	18 52	18 12
Pavonis ...	38	59	20	38	57	17
Cygni	57	21 18	39	55	19 16	36
Cygni	22 21	42	21 3	20 19	40	19 0
Cygni	27	47	9	25	46	6
Cephei	22 35	21 56	21 18	20 35	19 54	19 15
Aquarii ...	43	22 4	26	42	20 3	23
Cephei	47	8	30	46	7	27
Pegasi	57	18	40	56	17	37
Aquarii ...	23 18	39	22 0	21 17	38	58
Gruis	23 18	22 39	22 0	21 17	20 38	19 58
Pegasi	54	23 15	36	53	21 14	20 34
Pisc. Aust.	0 13	30	51	22 7	20	40
Pegasi	21	38	59	15	37	57
Piscium ..	56	0 17	23 34	50	22 12	21 32

Declina- tion.		MAY.			JUNE.		
		1.	11.	21.	1.	11.	21.
° ,		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
26 19 N.	α Androm. ...	21 21	20 41	20 2	19 19	18 39	18 0
14 34 N.	γ Pegasi	26	46	7	24	44	5
78 3 S.	β Hydri	39	59	20	37	57	18
55 46 N.	α Cassiop. ...	53	21 12	34	51	19 11	28
18 46 S.	β Ceti	56	17	38	55	15	26
86 33 N.	Pole Star	22 23	21 44	21 5	20 22	19 43	19 3
8 55 S.	θ Ceti	26	57	18	35	55	15
57 59 S.	α Eridani ...	52	22 12	34	51	20 11	28
22 49 N.	α Arietis	23 13	38	29 0	21 17	37	26
2 38 N.	γ Ceti	55	23 15	37	54	21 14	20 25
8 39 N.	α Ceti	0 18	23 34	22 55	22 12	21 33	20 54
49 21 N.	α Persei	37	53	23 14	31	52	21 13
23 40 N.	η Tauri	1 2	0 22	39	56	22 17	20 56
18 55 S.	γ Eridani ...	15	35	52	23 9	30	51
16 13 N.	α Tauri	51	1 11	0 32	45	23 5	22 26
45 51 N.	α Aurigæ ...	2 29	1 49	1 10	0 27	23 43	23 4
8 22 S.	β Orionis	31	51	12	29	45	16
28 29 N.	β Tauri	41	2 1	22	39	55	26
0 24 S.	β Orionis	43	8	29	46	0 6	25
17 56 S.	α Leporis ...	50	10	31	48	8	25
1 18 S.	α Orionis	2 52	2 12	1 33	0 50	0 10	23 27
34 9 S.	α Columbeæ ..	58	18	39	58	16	26
7 23 N.	α Orionis	3 11	31	52	1 9	29	0 17
22 35 N.	μ Geminor. ...	38	56	2 19	36	58	28
52 37 S.	α Argus	45	3 5	26	43	1 3	28
87 15 N.	51 Cephei	3 51	3 11	2 32	1 49	1 9	0 29
16 31 S.	α Canis Maj. ...	4 1	22	43	2 0	20	41
28 47 S.	α Canis Maj. ...	16	37	58	15	35	56
22 14 N.	β Geminor. ...	34	55	3 16	33	53	1 14
32 12 N.	α ³ Geminor. ...	48	4 8	30	47	2 7	28
5 35 N.	α Canis Min. ...	4 54	4 14	3 36	2 53	2 13	1 24
28 22 N.	β Geminor. ...	59	19	41	58	18	29
23 54 S.	15 Argus	5 24	44	4 5	3 23	43	2 4
6 56 N.	α Hydre	6 2	5 22	43	4 1	3 21	42
46 36 N.	α Ursæ Maj. ...	12	32	53	11	31	29
58 41 S.	α Argus	6 36	5 56	5 17	4 34	3 55	3 25
8 3 S.	α Hydre	43	6 3	24	41	4 1	28
52 19 N.	θ Ursæ Maj. ...	46	6	27	44	4	28
24 26 N.	α Leonis	7 0	30	41	58	18	29
12 40 N.	α Leonis	22	42	6 4	5 21	41	4 1
20 33 N.	γ ¹ Leonis	7 34	6 54	6 15	5 32	4 52	4 13
58 56 S.	γ Argus	8 2	7 22	43	6 0	5 20	4 41
62 31 N.	α Ursæ Maj. ...	17	37	58	15	35	56
21 18 N.	β Leonis	29	49	7 10	27	47	5 1
14 1 S.	β Hydre	35	55	16	33	53	4 14
15 22 N.	β Leonis	9 4	8 24	7 45	7 2	6 23	5 6
54 29 N.	γ Ursæ Maj. ...	8	29	50	7	27	6
73 31 S.	β Chamæle. ...	32	52	8 13	20	50	6 11
62 19 S.	α ¹ Crucis	41	9 1	22	39	59	9
22 37 S.	β Corvi	49	9 9	30	45	7 7	5

TABLE 9.]

MEAN TIMES OF TRANSITS OF PRINCIPAL STARS.

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Declina- tion.		MAY.			JUNE.		
		1.	11.	21.	1.	11.	21.
° ,		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
29 5 N.	12 Can. Ven...	10 11	9 32	8 53	8 10	7 30	6 51
10 25 S.	α Virginis ...	39	10 0	9 21	38	58	7 19
50 1 N.	γ Ursa Maj...	11 3	23	45	9 2	8 22	43
19 6 N.	γ Bootis	9	29	51	8	28	49
59 41 S.	β Centauri ...	15	35	57	14	34	55
19 55 N.	α Bootis	11 31	10 51	10 13	9 30	8 50	8 11
60 15 S.	α Centauri ...	51	11 11	32	50	9 10	31
27 40 N.	γ Bootis	12 0	20	41	59	19	40
15 27 S.	α Libræ	4	24	45	10 3	23	44
74 44 N.	β Ursa Min...	13	33	54	12	32	53
8 52 S.	β Libræ	12 31	11 51	11 12	10 30	9 50	9 11
27 12 N.	α Corv. Bor...	50	12 10	31	43	10 8	30
6 52 N.	α Serpentis...	59	19	40	57	17	39
78 14 N.	ζ Ursa Min...	13 12	32	53	11 10	30	52
19 25 S.	β Scorpil.....	18	35	59	16	36	58
8 20 S.	δ Ophiuchi...	13 28	12 48	12 9	11 26	10 46	10 8
26 7 S.	α Scorpil.....	43	13 2	23	40	11 0	21
61 50 N.	γ Draconis ...	44	4	25	42	2	23
68 46 S.	α Tri. Aust...	54	14	35	53	12	33
82 16 N.	γ Ursa Min...	14 24	44	13 5	12 22	43	11 4
14 33 N.	α Herculis ...	14 30	13 50	13 11	12 28	11 48	11 10
52 24 N.	β Draconis ...	49	14 9	30	47	12 7	28
12 40 N.	α Ophiuchi ...	50	10	31	48	8	29
89 17 S.	γ Octantis ...	15 10	30	51	13 8	28	49
51 30 N.	γ Draconis ...	15	35	56	13	33	54
21 6 S.	μ Sagittari...	15 27	14 47	14 8	13 25	12 45	12 6
86 36 N.	δ Ursa Min...	43	15 4	25	42	13 2	23
88 39 N.	α Lyræ.....	53	14	35	52	12	33
33 12 N.	β Lyræ.....	16 5	26	47	14 4	24	45
18 39 N.	ζ Aquilæ.....	22	43	15 4	21	41	13 2
2 50 N.	δ Aquilæ.....	16 42	16 3	15 4	14 41	14 1	13 23
10 16 N.	γ Aquilæ.....	17 0	20	42	59	19	40
8 20 N.	α Aquilæ.....	4	24	46	15 3	23	44
6 3 N.	β Aquilæ.....	9	29	51	8	28	49
86 53 N.	λ Ursa Min...	28	43	16 9	26	47	14 7
12 59 S.	α Capricor...	17 33	16 53	16 14	15 31	14 51	14 12
57 11 S.	α Pavonis ...	38	58	19	37	57	18
44 46 N.	α Cygni	57	17 17	38	56	15 16	37
38 3 N.	β Cygni	18 21	41	17 2	16 19	40	15 0
29 39 N.	ζ Cygni	27	47	8	25	45	6
61 59 N.	α Cephei	18 36	17 56	17 17	16 34	15 54	15 15
6 12 S.	β Aquarii ...	44	18 4	25	42	16 2	23
69 56 N.	β Cephei	43	8	29	46	6	27
9 14 N.	γ Pegasi	56	13	39	56	16	33
1 1 S.	α Aquarii ...	19 19	39	18 0	17 17	37	58
47 39 S.	α Gruis	19 19	18 39	18 0	17 17	16 37	15 58
10 5 N.	ζ Pegasi	55	19 15	36	53	17 13	16 34
30 22 S.	α Pisc. Aust...	20 10	30	51	13 8	23	43
14 27 N.	α Pegasi	18	38	59	13	33	54
4 51 N.	γ Piscium ...	58	20 13	19 34	51	18 11	17 30

Declina- tion.		JULY.			AUGUST.		
		1.	11.	21.	1.	11.	21.
° ' "		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
28 19 N.	α Androm.	17 20	16 41	16 2	15 19	14 40	14 1
14 24 N.	γ Pegasi	25	46	7	24	45	6
78 3 S.	β Hydri	38	59	20	37	58	19
55 46 N.	α Cassiop. ...	52	17 13	34	51	15 12	33
18 46 S.	β Ceti	56	17	38	55	16	37
88 33 N.	Pole Star	18 23	17 44	17 5	16 22	15 43	15 4
8 55 S.	θ ¹ Ceti	26	57	18	34	56	17
57 58 S.	α Eridani	52	18 13	34	50	16 11	33
22 48 N.	α Arietis	19 18	39	18 0	17 16	37	59
2 38 N.	γ Ceti	55	19 16	37	53	17 14	16 36
3 32 N.	α Ceti	20 14	19 35	18 56	18 12	17 33	16 54
49 21 N.	α Persei	33	54	19 15	31	52	17 13
23 40 N.	η Tauri	58	20 19	40	56	18 17	38
13 55 S.	γ ¹ Eridani	21 11	32	53	19 9	30	51
16 13 N.	α Tauri	47	21 8	20 29	45	19 6	18 27
45 51 N.	α Aurigæ.....	22 24	21 45	21 6	20 23	19 44	19 6
8 22 S.	β Orionis.....	26	48	9	25	46	7
28 29 N.	β Tauri	36	57	19	35	56	17
0 24 S.	δ Orionis.....	43	22 4	26	42	20 3	24
17 56 S.	α Leporis.....	45	6	28	44	5	26
1 18 S.	ε Orionis.....	22 47	22 8	21 31	20 46	20 7	19 28
34 9 S.	α Columbae...	53	14	36	52	13	54
7 23 N.	α Orionis.....	23 6	27	49	21 5	26	47
22 35 N.	μ Geminor....	33	54	22 10	32	53	20 14
52 37 S.	α Argus	40	23 1	22	39	21 0	21
87 15 N.	51 Cephei.....	23 49	23 9	22 30	21 47	21 8	20 29
16 31 S.	α Canis Maj.	0 2	22	43	22 0	21	43
28 47 S.	ε Canis Maj.	16	36	57	4	35	56
22 14 N.	δ Geminor....	34	54	23 15	32	53	21 14
32 12 N.	α ² Geminor....	48	0 8	29	46	22 7	28
5 35 N.	α Canis Min.	0 54	0 15	23 36	22 52	22 13	21 34
28 22 N.	β Geminor....	59	20	41	57	18	30
23 54 S.	15 Argus	1 24	45	0 6	23 22	43	22 4
6 56 N.	ε Hydre	2 2	1 23	44	0 0	23 21	42
48 36 N.	ε Ursæ Maj..	12	33	54	10	31	53
58 41 S.	ε Argus	2 36	1 57	1 18	0 34	23 54	23 15
8 3 S.	α Hydre	43	2 4	25	41	0 2	23
52 19 N.	θ Ursæ Maj..	46	7	28	44	5	28
24 28 N.	ε Leonis	3 0	21	42	58	19	40
12 40 N.	α Leonis	23	44	2 5	1 21	42	0 3
20 33 N.	γ ¹ Leonis	3 34	2 55	2 10	1 32	0 53	0 14
55 56 S.	η Argus	4 1	3 23	44	2 0	1 21	47
62 31 N.	α Ursæ Maj..	16	38	59	15	36	37
21 18 N.	δ Leonis	28	50	3 11	27	48	1 9
14 1 S.	δ Hydre	34	56	17	33	54	15
15 22 N.	β Leonis	5 3	4 24	3 45	3 2	2 23	1 44
54 29 N.	γ Ursæ Maj..	8	29	51	7	28	46
78 31 S.	β Chamæel. ...	31	52	4 14	30	51	2 12
62 19 S.	α Crucis	40	5 1	22	33	3 0	2
22 37 S.	β Corvi	43	9	30	47	3 0	2

TABLE 9.]

MEAN TIMES OF TRANSITS OF PRINCIPAL STARS.

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Declina- tion.		JULY.			AUGUST.		
		1.	11.	21.	1.	11.	21.
° ' "		h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
89 5 N.	12 Can. Ven...	6 11	5 32	4 53	4 9	3 31	2 52
10 25 S.	α Virginis ...	39	6 0	5 21	37	59	3 20
50 1 N.	γ Ursæ Maj...	7 3	24	45	5 1	4 22	44
19 6 N.	γ Bootis	9	30	51	7	25	50
59 41 S.	β Centauri ...	15	36	57	13	34	56
19 55 N.	α Bootis	7 31	6 52	6 13	5 29	4 50	4 11
60 15 S.	α Centauri ...	51	7 12	33	49	5 10	31
27 40 N.	β Bootis	8 0	21	42	55	19	40
15 27 S.	α Libræ	4	25	46	6 2	23	44
74 44 N.	β Ursæ Min.	13	34	55	11	32	53
8 52 S.	β Libræ	8 31	7 52	7 13	6 29	5 50	5 11
27 12 N.	α Corv. Bor...	50	8 11	32	43	6 9	30
6 52 N.	α Serpentis .	59	20	41	57	18	39
73 14 N.	ζ Ursæ Min.	9 12	33	54	7 10	31	52
19 25 S.	β Scorpil...	18	39	8 0	16	37	58
3 20 S.	δ Ophiuchi...	9 23	8 49	8 10	7 26	6 47	6 8
26 7 S.	α Scorpil...	42	9 3	24	40	7 1	22
61 50 N.	γ Draconis ...	44	5	26	42	3	24
68 48 S.	α Triæ Aust.	54	15	36	52	13	34
69 16 N.	ε Ursæ Min.	10 23	45	9 6	8 22	43	7 4
14 33 N.	α Herculis ...	10 29	9 51	9 12	8 28	7 49	7 10
52 24 N.	α Draconis ...	43	10 9	31	47	8 8	29
12 40 N.	α Ophiuchi...	49	10	32	43	9	30
39 17 S.	ε Octantis ...	11 10	30	51	9 7	26	49
51 30 N.	γ Draconis ...	16	36	57	13	34	55
21 6 S.	μ ¹ Sagittarii...	11 26	10 47	10 9	9 25	8 46	8 7
36 36 N.	δ Ursæ Min.	43	11 4	25	42	9 3	24
38 39 N.	α Lyræ	53	14	35	52	13	34
33 12 N.	β Lyræ	12 5	26	47	10 4	25	46
13 39 N.	ζ Aquilæ.....	22	43	11 4	21	42	9 3
2 50 N.	δ Aquilæ.....	12 42	12 3	11 24	10 41	10 2	9 23
10 16 N.	γ Aquilæ.....	13 0	21	42	56	19	41
8 30 N.	α Aquilæ.....	4	25	46	11 2	23	45
6 3 N.	β Aquilæ.....	9	30	51	7	28	50
35 53 N.	λ Ursæ Min.	29	49	12 10	26	47	10 8
12 59 S.	α Capricor...	13 33	12 53	12 14	11 30	10 51	10 12
57 11 S.	α Pavonis ...	38	19	35	56	56	17
44 46 N.	α Cygni	57	13 18	39	55	11 16	37
38 3 N.	β ¹ Cygni	14 21	42	13 3	12 19	40	11 1
29 39 N.	ζ Cygni	27	43	9	25	46	7
61 59 N.	α Cephei	14 36	13 57	13 18	12 34	11 55	11 16
6 12 S.	β Aquarii ...	44	14 5	26	42	12 3	24
69 56 N.	β Cephei	45	9	30	46	7	28
9 14 N.	ε Pegasi	56	19	40	56	17	35
1 1 S.	α Aquarii ...	15 19	40	14 1	13 17	38	59
47 39 S.	α Græis	15 19	14 40	14 1	13 17	12 38	11 59
10 5 N.	ζ Pegasi	56	15 20	41	57	13 13	12 39
30 22 S.	α Pisc. Aust.	16 9	31	52	14 8	23	30
14 27 N.	α Pegasi	17	39	15 0	16	37	38
4 51 N.	ι Piscium ...	52	16 14	35	51	14 12	13 33

Declina- tion.		NOVEMBER.			DECEMBER.	
		1.	11.	21.	1.	11.
°		h. m.	h. m.	h. m.	h. m.	h. m.
26 19 N.	α Androm. ...	9 16	8 37	7 58	7 18	6 40
14 24 N.	γ Pegasi ...	21	42	8 3	28	19
78 3 S.	β Hydri ...	34	55	16	36	27
55 46 N.	α Cassiop. ...	48	9 9	30	50	41
18 46 S.	β Ceti ...	52	13	34	54	45
86 33 N.	Pole Star ...	10 19	9 40	9 1	8 21	7 42
8 55 S.	β Ceti ...	32	53	14	34	25
57 58 S.	α Eridani ...	48	10 9	30	50	41
22 48 N.	α Arietis ...	11 14	35	56	9 16	8 37
2 38 N.	γ Ceti ...	51	11 12	10 33	53	44
3 32 N.	α Ceti ...	12 10	11 31	10 52	10 12	9 33
49 21 N.	α Persei ...	29	50	11 11	31	22
23 40 N.	γ Tauri ...	54	12 15	36	58	49
13 55 S.	γ ¹ Eridani ...	13 7	28	49	11 9	10 30
16 13 N.	α Tauri ...	43	13 4	12 25	5	11 6
45 51 N.	α Aurigæ ...	14 21	13 42	13 3	12 23	11 44
8 22 S.	β Orionis ...	23	44	5	5	46
26 29 N.	β Tauri ...	33	54	15	33	24
0 34 S.	δ Orionis ...	40	14 1	22	22	13 3
17 56 S.	α Leporis ...	42	3	24	24	15
1 18 S.	α Orionis ...	14 44	14 5	13 25	12 46	12 7
34 9 S.	α Columbe ...	50	11	32	53	44
7 23 N.	α Orionis ...	15 3	24	45	13 5	12 1
23 35 N.	μ Geminor. ...	30	51	14 12	32	23
52 37 S.	α Argus ...	37	58	19	39	30
87 15 N.	51 Cephei ...	15 45	15 6	14 27	1 5	47
16 31 S.	α Canis Maj. ...	58	19	40	1 4	0
28 47 S.	α Canis Maj. ...	16 11	33	54	14	5
22 14 N.	δ Geminor. ...	28	50	15 11	31	22
32 12 N.	α ² Geminor. ...	44	16 5	26	46	37
5 35 N.	α Canis Min. ...	16 50	16 11	15 31	1 5	51
25 22 N.	β Geminor. ...	54	15	35	1 5	50
28 54 S.	15 Argus ...	17 19	40	16 0	1 5	59
6 56 N.	α Hydre ...	58	17 19	39	16	9
48 36 N.	α Urse Maj. ...	18 8	29	49	16	33
58 41 S.	α Argus ...	18 31	17 52	17 13	16	40
8 3 S.	α Hydre ...	38	59	20	16	43
52 19 N.	θ Urse Maj. ...	41	18 2	23	16	58
24 26 N.	α Leonis ...	56	17	38	17	21
12 40 N.	α Leonis ...	19 19	40	18 1	17	28
20 33 N.	γ ¹ Leonis ...	19 26	18 47	18 8	17	56
58 56 S.	γ Argus ...	54	19 15	36	17	11
62 31 N.	α Urse Maj. ...	20 9	30	51	18	23
21 18 N.	δ Leonis ...	21	42	19 3	18	29
14 1 S.	δ Hydre ...	27	48	9	18	58
15 22 N.	β Leonis ...	20 56	20 17	19 38	18	9
54 29 N.	γ Urse Maj. ...	21 1	22	43	19	26
78 31 S.	β Chamele. ...	24	45	20 6	19	26
62 19 S.	α ¹ Crucis ...	33	54	15	19	26
22 37 S.	β Corvi ...	41	21 2	23	19	26

	NOVEMBER.			DECEMBER.		
	1.	11.	21.	1.	11.	21.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
12 Can. Ven...	22 3	21 25	20 46	20 6	19 27	18 47
α Virginis ...	31	53	21 14	34	55	19 15
γ Ursæ Maj...	55	22 16	23	58	20 19	20
γ Bootis	23 1	22	44	21 4	25	45
β Centauri ...	7	23	50	10	31	51
α Bootis	23 23	22 44	22 5	21 26	20 47	20 7
α Centauri ...	43	23 4	25	46	21 7	27
α Bootis	52	13	34	55	16	26
α Librae	56	17	38	59	20	40
β Ursæ Min...	0 9	26	47	22 8	29	49
β Librae	0 27	23 44	23 5	22 25	21 47	21 7
α Coro. Bor...	46	0 7	24	44	22 5	26
α Serpentis...	55	16	33	58	14	25
ζ Ursæ Min...	1 9	29	46	23 6	27	48
β ¹ Scorpii	15	35	52	12	23	54
δ Ophiuchi...	1 25	0 45	0 6	23 22	22 43	22 4
α Scorpii	38	59	20	26	57	17
γ Draconis ...	40	1 1	22	28	59	19
α Tris. Aust.	50	11	32	48	23 9	29
α Ursæ Min...	2 20	41	1 2	0 22	39	59
α Herculis ...	2 26	1 47	1 8	0 26	23 45	23 5
β Draconis ...	45	2 6	27	47	0 8	28
α Ophiuchi...	46	7	28	49	9	29
α Octantis ...	3 3	24	45	1 5	26	46
γ Draconis ...	11	32	53	12	34	54
α ¹ Sagittarii...	3 23	2 44	2 5	1 25	0 46	0 6
δ Ursæ Min...	40	3 1	22	42	1 3	23
α Lyrae	50	11	32	52	12	33
β Lyrae	4 2	23	44	2 4	25	45
ζ Aquilæ	18	39	3 0	20	41	1 1
δ Aquilæ	4 38	3 59	3 20	2 40	2 1	1 21
γ Aquilæ	56	4 17	39	59	19	40
α Aquilæ	5 0	21	43	3 3	24	44
β Aquilæ	5	26	48	8	29	49
λ Ursæ Min...	23	44	4 5	25	46	2 7
α ² Capricorn...	5 23	4 49	4 10	3 30	2 51	2 12
α Pavonis ...	32	53	14	34	55	16
α Cygni	53	5 14	35	56	3 17	37
β ¹ Cygni	6 17	38	59	4 20	41	3 1
ζ Cygni	33	44	5 5	26	47	7
α Cephei	6 32	5 53	5 14	4 35	3 56	3 16
β Aquarii	40	6 1	22	43	4 4	24
β Cephei	44	5	26	46	7	28
α Pegasi	54	15	36	56	17	28
α Aquarii ...	7 15	36	57	5 17	38	59
α Grus	7 15	6 36	5 57	5 17	4 38	3 59
ζ Pegasi	51	7 12	6 33	53	5 14	4 35
α Pisc. Aust...	8 6	27	48	6 8	50	49
α Pegasi	14	35	56	16	37	57
α Piscium ...	49	8 10	7 31	51	6 12	5 33

TABLE 11.

132		ALTITUDE MOST SUITABLE FOR FINDING TIME.																					
		Declination of the same name as the Latitude.																					
Lat.		0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°											
°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'
1	0	0	30	0	14	29	9	37	7	12	5	46	4	49	4	8	3	38	8	14	2	55	
2	0	0	30	0	30	1	19	30	14	31	11	36	9	40	8	18	7	16	6	29	5	51	
3	0	0	41	49	48	37	30	3	22	5	17	32	14	35	12	30	10	57	9	45	8	48	
4	0	0	30	1	90	0	41	52	30	5	23	41	19	36	16	45	14	40	13	3	11	46	
5	0	0	23	36	53	10	56	30	38	46	30	8	24	47	21	7	18	26	16	23	14	46	
6	0	0	19	30	41	52	90	0	48	41	37	1	30	11	25	36	22	17	19	46	17	48	
7	0	0	16	38	34	55	59	4	61	7	44	34	35	63	30	15	26	14	23	14	20	52	
8	0	0	14	31	30	5	48	41	90	0	53	16	42	1	35	7	30	20	26	46	24	1	
9	0	0	12	53	26	29	41	56	62	50	64	16	48	48	40	17	34	35	30	25	27	13	
10	0	0	11	36	23	41	37	1	53	16	90	0	56	38	45	52	39	3	34	11	30	31	
11	0	0	10	32	21	27	33	13	46	50	65	31	66	36	52	4	43	48	38	8	33	55	
12	0	0	9	40	19	36	30	11	42	1	56	38	90	0	59	15	48	58	42	17	37	26	
13	0	0	8	56	18	4	27	41	38	13	50	32	67	33	68	25	54	42	46	43	41	8	
14	0	0	18	16	45	25	36	35	7	45	52	59	15	90	0	61	22	51	32	45	1	1	
15	0	0	7	45	15	38	23	49	32	32	42	8	53	27	69	11	69	53	56	53	49	11	
16	0	0	16	14	40	22	17	30	20	39	3	48	58	61	22	90	0	63	7	53	42	1	
17	0	0	6	51	13	48	20	57	28	26	36	26	45	20	55	70	31	71	7	58	45	1	
18	0	0	29	13	3	19	46	26	46	34	11	42	17	51	32	63	7	90	0	64	37	1	
19	0	0	9	12	22	18	44	25	18	32	14	39	41	48	0	57	51	71	39	72	9	6	
20	0	0	5	51	11	46	17	48	24	1	30	31	37	26	45	1	53	42	64	37	90	0	
21	0	0	35	13	16	57	32	51	28	59	35	28	42	28	50	17	59	34	73	38	1	1	
22	0	0	21	10	44	12	21	49	27	37	33	43	40	14	47	22	55	35	65	55	1	1	
23	0	0	7	17	15	31	20	52	26	23	32	9	38	15	44	52	52	16	61	5	7	1	
24	0	0	4	55	9	53	14	53	1	25	16	30	45	36	30	42	40	49	27	57	14	6	
25	0	0	44	30	19	14	24	16	29	28	34	55	40	43	46	59	54	1	6	1	1	1	
26	0	0	34	9	13	48	18	31	23	20	28	19	33	30	38	58	44	49	51	17	5	1	
27	0	0	25	8	50	19	17	51	22	29	27	15	32	12	37	23	42	54	48	58	6	1	
28	0	0	16	33	12	52	15	21	42	26	17	31	1	35	57	41	10	46	46	6	1	1	
29	0	0	8	16	27	16	41	20	69	25	24	29	56	34	39	36	44	52	5	1	1	1	
30	0	0	4	0	8	1	12	4	16	10	20	19	34	34	28	56	33	27	38	10	43	10	
31	0	0	3	53	7	47	11	43	15	41	19	42	23	49	1	32	21	36	52	41	37	4	
32	0	0	47	34	23	14	8	6	27	10	31	21	35	40	10	42	40	12	4	1	1	1	
33	0	0	40	22	4	14	48	18	36	22	26	26	22	30	24	34	34	38	54	4	1	1	
34	0	0	35	10	10	46	25	5	21	50	25	38	29	32	33	33	37	42	4	1	1	1	
35	0	0	29	6	59	30	3	17	37	15	24	67	28	43	32	36	36	36	4	1	1	1	
36	0	0	24	49	16	13	42	11	20	43	18	27	58	31	43	35	35	3	1	1	1	1	
37	0	0	19	39	0	22	16	46	13	23	42	16	30	54	34	38	3	1	1	1	1	1	
38	0	0	15	31	9	47	4	23	19	44	8	26	36	8	33	45	3	1	1	1	1	1	
39	0	0	11	22	34	12	47	1	18	22	36	25	59	29	25	32	56	3	1	1	1	1	
40	0	0	3	7	6	14	9	22	12	30	15	40	18	52	22	7	25	24	28	44	32	9	
41	0	0	3	6	10	15	21	29	21	38	24	51	6	31	25	3	6	31	25	3	1	1	
42	0	0	2	59	5	59	8	59	0	2	6	12	20	27	30	30	44	6	3	1	1	1	
43	0	0	56	52	49	11	47	14	45	17	45	20	47	23	50	26	57	6	3	1	1	1	
44	0	0	53	46	39	33	29	25	23	23	23	25	29	30	30	3	6	3	1	1	1	1	
45	0	0	50	40	30	21	13	6	0	22	57	25	55	28	56	3	6	3	1	1	1	1	
46	0	0	47	34	21	9	13	58	16	48	19	39	32	26	23	6	3	1	1	1	1	1	
47	0	0	44	28	13	10	58	44	31	19	8	0	27	53	3	6	3	1	1	1	1	1	
48	0	0	42	23	5	48	31	15	0	21	46	24	34	24	2	6	3	1	1	1	1	1	
49	0	0	39	18	7	58	38	18	15	59	18	42	25	10	26	57	2	6	3	1	1	1	
50	0	0	2	37	5	13	7	51	10	28	13	6	15	45	18	25	21	5	23	47	26	31	
51	0	0	32	5	37	10	12	44	18	17	53	20	28	5	25	43	2	6	3	1	1	1	
52	0	0	28	4	57	25	9	54	24	14	54	24	19	55	22	27	1	6	3	1	1	1	
53	0	0	25	50	15	40	5	31	16	58	25	21	53	24	22	2	6	3	1	1	1	1	
54	0	0	22	43	5	27	11	49	11	35	18	58	22	23	47	6	3	1	1	1	1	1	
55	0	0	19	37	6	56	15	34	13	53	13	34	20	54	16	2	6	3	1	1	1	1	
56	0	0	16	31	47	3	19	37	15	54	12	29	22	48	6	3	1	1	1	1	1	1	
57	0	0	14	27	41	8	54	8	23	37	17	52	7	22	6	3	1	1	1	1	1	1	
58	0	0	11	23	34	40	10	57	9	21	34	19	48	21	60	7	6	3	1	1	1	1	
59	0	0	9	19	28	28	48	12	57	7	18	28	20	6	7	6	3	1	1	1	1	1	
60	0	0	8	15	23	31	39	47	14	55	31	12	7	6	7	6	3	1	1	1	1	1	

Declination of the same name as the Latitude.

26°	28°	30°	32°	34°	36°	38°	40°	42°	44°	46°	48°	50°
17	2	8	2	0	1	53	1	47	1	42	1	37
34	4	16	4	0	3	47	3	35	3	24	3	15
51	6	24	6	0	5	40	5	22	5	6	4	53
9	8	33	8	1	7	34	7	10	6	49	6	31
28	10	42	10	2	9	28	8	58	8	32	8	8
48	12	52	12	4	11	23	10	46	10	16	9	47
8	15	3	14	6	13	18	12	35	11	58	11	25
31	17	15	16	10	15	14	14	25	13	42	13	4
54	19	28	18	14	17	10	16	15	15	26	14	43
20	21	42	20	19	8	18	5	17	11	16	23	15
48	23	59	22	26	21	6	19	57	18	3	17	16
19	26	17	24	34	23	6	21	50	20	43	19	44
52	28	38	26	44	25	7	23	43	22	30	21	26
30	31	1	28	56	27	10	25	38	24	18	23	8
13	33	27	31	10	29	14	27	34	26	8	24	52
58	35	37	33	27	31	21	29	32	27	58	26	36
50	38	31	35	47	33	29	31	29	50	28	21	27
49	41	10	38	10	35	40	33	33	31	43	30	8
58	43	54	40	38	37	54	35	36	33	38	31	56
17	46	46	43	10	40	12	37	42	35	35	33	45
50	49	46	45	47	42	33	39	51	37	34	35	36
43	52	56	48	31	44	59	42	4	39	36	37	29
2	56	20	51	24	47	30	44	20	41	40	39	24
6	60	2	64	26	50	8	46	40	43	47	41	21
36	64	11	67	42	52	54	49	6	45	58	43	21
0	69	2	61	15	45	49	51	37	48	14	45	24
56	75	15	65	14	58	57	54	17	50	34	47	31
2	90	0	69	52	62	22	57	6	53	0	49	41
43	75	33	75	50	66	11	60	7	55	34	51	57
15	69	52	90	0	70	39	63	24	58	17	54	18
20	65	43	76	7	76	23	67	5	61	11	56	47
49	62	22	70	39	90	0	71	23	64	22	59	24
36	59	32	66	38	76	39	76	54	67	55	62	12
37	57	6	63	24	71	23	90	0	72	3	65	16
54	54	56	60	40	67	30	77	8	77	22	68	42
14	53	0	58	17	64	22	72	3	90	0	72	42
45	51	16	6	11	61	42	68	18	77	36	77	49
24	49	41	54	18	59	24	65	16	72	42	90	0
9	48	15	52	37	57	24	62	42	69	4	78	2
0	46	55	51	4	55	32	60	27	66	8	73	18
56	45	42	49	39	53	58	28	63	88	69	47	78
56	44	33	48	21	52	22	56	41	61	27	66	56
0	43	30	47	9	50	59	5	59	32	64	31	70
8	42	31	46	2	49	43	53	37	57	48	62	25
19	41	36	45	0	48	32	52	16	56	14	60	32
33	40	45	44	2	47	27	51	1	54	48	58	51
50	39	56	43	8	46	26	49	52	53	29	57	20
9	38	28	41	29	44	36	47	49	51	9	54	40
54	37	48	40	45	43	46	46	53	50	7	53	29
48	36	34	39	23	42	16	45	12	48	14	51	23
49	35	28	38	10	40	55	43	43	46	36	49	33
55	34	30	37	6	39	44	42	25	45	3	47	57
8	33	37	36	8	38	40	41	15	43	53	46	33
25	32	50	35	16	37	44	40	13	42	45	45	19
46	31	30	36	53	39	18	41	44	44	13	46	43
11	31	30	33	48	8	38	28	40	51	43	44	45
41	30	55	11	35	27	37	45	3	42	22	44	43
13	29	32	28	34	51	6	39	20	41	36	43	53
49	29	59	9	20	36	31	38	43	40	56	10	45

PROPER NAMES OF CERTAIN OF THE PRINCIPAL FIXED STARS.

α Ursæ Minoris, that is,	α of Ursa Minor (Little Bear)	Polaris
α Andromedæ	α of Andromeda	Alpheratz
γ Pegasi	γ of Pegasus	Algenet
α Cassiopeæ	α of Cassiopea	Schedar
α Eridani	α of Eridanus	Achernar
α Persei	α of Perseus	Mirfak
β Persei	β of Perseus	Algenol
α Tauri	α of Taurus (Bull)	Aldebaran
α Aurigæ	α of Auriga (Charioteer)	Capella
α Orionis	α of Orion	Betelgeuse
β Orionis	β of Orion	Rigel
γ Orionis	γ of Orion	Bellatrix
α Argus	α of Argo	Canopus
α Canis Majoris,	α of Canis Major (Great Dog)	Sirius
α Canis Minoris	α of Canis Minor (Little Dog)	Procyon
α^2 Geminorum	α^2 of Gemini (Twins)	Castor
β Geminorum	β of Gemini	Pollux
α Leonis	α of Leo (Lion)	Regulus
β Leonis	β of Leo	Deneb
α Ursæ Majoris	α of Ursa Major (Great Bear)	Dubhe
α Virginis	α of Virgo (Virgin)	Spica
α Bootis	α of Bootes (Herdsman)	Arcturus
α Scorpii	α of Scorpio (Scorpion)	Antares
α Lyræ	α of Lyra (Harp)	Vega
α Aquilæ	α of Aquila (Eagle)	Altair
α Cygni	α of Cygnus (Swan)	Deneb
α Piscis Australis	α of Piscis Aust. (Southern Fish)	Fomalhaut
α Pegasi	α of Pegasus	Markab

α (a) Alpha, β (b) Beta, γ (g) Gamma, δ (d) Delta, ϵ (e) Epsilon, ζ (z) Zeta, η (h) Eta, θ (th) Theta, ι (i) Iota, κ (k) Kappa, λ (l) Lambda, μ (m) Mu, ν (n) Nu, ξ (x) Xi, \omicron (o) Omicron, π (p) Pi, ρ (r) Ro, σ (s) Sigma, τ (t) Tau, υ (u) Upsilon, ϕ (ph) Phi, χ (c) Chi, ψ (ps) Psi, ω (o) Omega.

NOTE

ON USING THE BLANK FORMS FOR THE DIFFERENT COMPUTATIONS OF NAUTICAL ASTRONOMY.

IN the Treatise to which the foregoing Tables are more especially adapted, a variety of *Blank Forms* are given to supply the place of verbal rules; but, as noticed in the Preface, the narrowness of the page rendered it sometimes necessary to depart from the arrangement of the several steps of the work as they appeared in the manuscript. We shall here exhibit a portion of one of these Forms, the Form at page 194, with the steps arranged as originally intended.

It may be remarked, however, that the relative positions on the paper, of the several distinct items of work, is a matter of little or no consequence. The main thing to be attended to, in filling up the blanks, is, first, to postpone reference to the Nautical Almanac and to the Book of Tables as long as possible, forwarding the work as much as we can without the aid of either; and, second, when the Nautical Almanac or the volume of Tables is once in hand, to make all the use of it we can before laying it down.

Thus, the partial Form on next page consists of four distinct items of computation; and, whether these be placed with respect to one another as here, or as in the Treatise referred to, we should proceed to fill up the blanks in the following manner:—

We should first insert the *Observed Altitude* in [1]; then passing to [2], we should fill up all the three blanks, and thus get the *Greenwich Date*. Taking now the first volume of the Tables, we should return to [1], and insert from them the corrections for *Index and Dip*, and for *Refraction—Parallax*.

We are now to take up the Nautical Almanac, and to extract from it the *Semidiameter*, the *Equation of Time*, and the *Noon Declination*, all of which particulars appear on the same page, inserting each as the blank form directs: and then, laying the Almanac aside, we are to complete this portion of the work, thus obtaining the *True Altitude*, the *EQUATION OF TIME*, and the *POLAR DISTANCE*.

PARIAL BLANK FORM. (Nautical Astronomy, page 194.)
For the True Altitude, Polar Distance, and Equation of Time

[1.]		[2.]		[3.]		[4.]	
Obs. alt.	° ' "	Time, per Watch	h m s	Equa. of Time	h m s	Noon Dec. at G.	° ' "
Index and Dip	° ' "	Long. in time	h m s	Cor. for the hra.	h m s	Cor. for the hra.	h m s
Semi-diam.	° ' "	MEAN TIME AT G.	h m s	Declination	° ' "	Declination	° ' "
App. alt. of centre	° ' "		h m s	Cor.	h m s	POLAR DIST.	° ' "
Ref.—Parallax	° ' "		h m s		h m s	Cor.	h m s
TRUE ALT. OF CENTRE	° ' "		h m s		h m s		h m s

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